THE

SURGICAL CLINICS

OF

NORTH AMERICA

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CLINIC OF DR JOHN F ERDMANN

POST-GRADUATE HOSPITAL

EXOPHTHALMIC GOITER

THE first patient is a woman thirty-one years of age who has been in the hospital under observation for ten days She gives the following history

Chief Complaint.—Choking sensation change in voice and nervousness.

Family History.—Negative for goiter tuberculosis, and cancer

Past History.—Scarlet fever when a child very sick. Influenza in 1918 and again in 1919 Nervous breakdown in 1915 which required residence in the country and careful treatment for one year

Symptoms at that time were weakness, severe headache, and insomnia.

Personal History.—Menstruation began at twelve, regular one and a half days, small amount. Since marriage regular two and a half days moderate. No change with the present condition. Married eight years, with two full term and one seven months' pregnancies

Present Condition.—In 1917 shortly after the second child was born, the enlargement of the neck was first noticed There has been a gradual increase accompanied by the following symptoms in the order of appearance Hoarseness and a change in the quality of the voice weakness, to the present exhaustion sweating from the least exertion, profuse at present itching of skin troublesome at times diarrhea for six months, in attacks of one week to ten days, no blood in stools palpitation from exertion

and excitement is becoming rapidly worse shortness of breath when *climbing stairs, particularly in the last two months* weight loss, 90 pounds in four years hair has been falling out in large quantities for six months, and has become straight and fine.

Physical examination on admission to the hospital.

General Appearance—Unduly excited by introduction, worried, looks frightened, face flushed and cheek bones prominent, eyes protrude and pupils are widely dilated. Movements are rapid, inclined to be jerky talking seems to tire patient quickly the voice is unnatural and weak.

Head—Hair is very fine, thin, dry and lifeless. Eyes are prominent, von Graefe's positive, pupils dilated, equal, and react *normally to light and accommodation, tension equal, movements* normal. Mouth teeth have had poor repair of large cavities, bridge-work in poor condition. Larynx cords slightly granular in appearance, movements normal, no paralysis, change in voice not due to anything detected by indirect examination.

Neck—Typical thyroid enlargement, right lobe size of lemon, smooth, and generally enlarged left lobe visible. Pulsation of tumor visible, moves with swallowing, freely movable from side to side, equal consistency throughout, soft, and non-fluctuant. Bruit heard over right lobe distinctly.

Heart—Normal size, sounds of good quality occasional extrasystole. Systolic murmur at base.

Lungs—Expansion equal, no consolidation, generalized bronchitis. Sputum negative for tuberculosis. Alveolar CO_2 tension 45

Abdomen—Negative.

Extremities—Cool and moist. Reflexes normal. Pulse 120 small and easily compressible. Blood-pressure 165 systolic, 90 diastolic.

Basal metabolism Nervous and excitable poor co-operation. Rate of 60.

The patient was placed in bed immediately in a quiet room with a special nurse. There is little that affects the reduction of toxemia in these patients beyond rest and comfort. Suggestion by the nurse and doctors plays no little part in securing rest and

putting the patient at ease and every opportunity to encourage the patient as to the outcome of the treatment should be taken advantage of.

An ice-bag has been applied to pericardium, two hours on and two hours off for past week.

The only drugs administered have been triple bromids, grains xx, t. i. d. codein, gram $\frac{1}{2}$ for cough when troublesome at night, and a mild cathartic pill to keep the bowels open. Diet has consisted of the routine hospital meals with restriction of fats for the past few days. The patient has been encouraged to drink water freely Ice-cap to heart, two hours on, two hours off

Tenth day following admission

General Appearance.—Quiet and rested, bright and cheerful. Anxious only to have the operation over

Temperature 99 4 F (rectal) Pulse 100 regular of good quality Blood-pressure 150/90 Metabolic rate 45 Normal 37.5 Examination of urine negative.

Preparation for Operation.—Day preceding Soda bicarbon ate 15 grams by mouth. Pulv glyc. 3 drams. Tap-water 1000 c.c. by rectum unless the patient is disturbed. This patient took 750 c.c. while sleeping last night. Neck is prepared by shaving only when this is necessary

Day of operation Light breakfast for afternoon operation. Small S S enema three hours before operation. No lunch is given, but tea or water may be taken until one hour and a half before operation. One hour before operation, morphin, grain $\frac{1}{4}$ and atropin, gr $\frac{1}{12}$

Anesthetic has been nitrous oxid and ether closed method. Pulse at the beginning of operation 120 color good, breathing quietly

Preparation of field One application of 3.5 per cent. tincture of iodin.

Position Dorsal, small sand-bag under shoulders, chin up head back.

Operation (Dr Erdmann)—I make the usual collar incision, here taking care to place the incision low so that it may be

covered later by the ordinary string of beads. You will notice that I cut through skin and platysma to the muscles before I begin reflecting the flap upward. There is considerable bleeding in this case as is usual in cases of hyperplasia. By separating the muscles in the entire length of the reflection I hope to be able to deliver the gland without cutting across the muscles. The gland with its capsule protrudes into the separation. It is not adherent to the capsule which strips away readily. I am delivering this right lobe with some difficulty as it is considerably enlarged, however I will not ha e to divide the muscles. The lower pole is the most accessible, and I begin by clamping the blood-supply here, leaving a part of the gland and all of the posterior capsule to avoid injury to the parathyroid and recurrent laryngeal nerve. The isthmus is enlarged and we will remove that in the same way. Now we will tie off these clamps and then examine the left lobe again. The left lobe is not cystic, nor is it enlarged to any extent.

This gross specimen has some parts that appear colloid and in other parts it is quite hard or hyperplastic. I do not wish you to think for a moment that it has the marks of malignancy but they are marks of typical hyperplasia. D Carter in sewing the wound is going to take in the deep fascia with the platysma, so there will be a much better scar. The drainage we place in will be allowed to remain f rty-eight to seventy-two hours. It is extremely essential, in suturing the skin that you do not puncture the jugular veins, as the hemorrhage is so severe that deeper sutures would have to be removed to control the bleeding.

We will give this patient immediately upon going to bed in the ward or room 1000 c.c. of tap-water containing 1 ounce of bicarbonate of soda and 1½ ounces of glucose, in a Murphy drip and a sufficient amount of morphin to control her absolutely. The patient is apt to be excitable and she may require anything from ½ to ⅓ grain. We will start her with ¼ grain. She should have her preliminary before the operation. Hyperthyroidism following operation ends fatally If t all at the end of a few hours, usually in eighteen to twenty-four. The patients develop a high temperature between twenty-two to twenty-three hours

postoperative. It is rare to have a postoperative hyperthyroid case die on the second or third day. The pulse now is 118 color is good and respiration is easy and smooth

The postoperative temperature sheet is reproduced here, showing a recovery of a borderline case. Twenty three hours after operation the patient became very restless, not irrational,
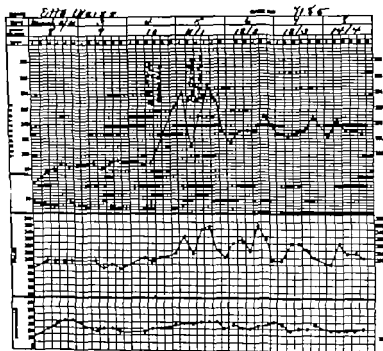

Fig 113 —Case 1

and the temperature rose to 104 F. She received ¼ grain of morphin in the first twenty four hours. She did not retain the Murphy drip so it was discontinued and fluids were given by the mouth and retained. In the second twenty four hours the temperature again rose to 104.6° F. with extreme restlessness. The pulse was rapid intermittent, and of poor quality. Ice bags were applied to each groin, pericardium, and to the head.

Morphin, grain ⅛ and sodium bromid, 130 grains, was given during the twenty-four hours. The bromid will control the restlessness better in some cases than morphin, and in this case it was so. The temperature did not rise above 102° F again the patient quieted down, and the pulse gradually came down to an average of 85 when the patient left the hospital on the twentieth day

Pathologic Examination of the Tissues—Gross Total weight 27 grams. The exterior is lobulated, but covered by smooth membrane. On section it is fleshy throughout and rather firm.

Microscopic—Sections show in part thyroid acini, more or less dilated by colloid material. Some areas, however show edematous hyperplasia with tendency to papillary formations of the epithelium lining the acini—a hyperplasia usually associated with exophthalmic goiter

Diagnosis.—Goiter partly colloid and partly Graves in type.

CYSTIC ADENOMA OF OVARY

The next patient is a woman fifty four years of age who complains of a rapidly growing tumor of the lower abdomen. She gives the following history

Chief Complaint.—Tumor of lower abdomen. Duration five months.

Family History—Negative for cancer and tuberculosis.

Past History—Operation ten years ago for a mass in the abdomen, appendix was removed at that time. Another operation seven years ago when something was done to her tubes, ovaries, and uterus, but just what she was unable to tell us. Pneumonia nine years ago sick in bed for three weeks.

Personal History—Married three normal children, four miscarriages. Otherwise normal.

Present History—Attention called to abdomen by the size of mass five months ago Has increased rapidly in size, accompanied by hemorrhage from vagina, beginning one month after the onset and lasting for thirty days, profuse for first few days, with rapid diminution. Frequent urination for six months very frequent and small in amount at present. Backache and dragging sensation in pelvis for three months. Constipation for six months. Fatigue very noticeable of late. There has been no loss in weight, and, in fact, she states there has been a gain (probably due to the tumor)

Physical examination on admission to the hospital

Heart—No enlargement, regular no murmurs heard.

Lungs—Normal expansion no râles, dulness, or adventitious sounds.

Temperature, 98.6° F   pulse, 80   respiration, 22   Blood pressure, 140/110

Urine Examination—Normal.

There is a scar from the appendicular operation and a scar from the section. The enlargement is that of a seven-month

pregnancy The tumor is large, solid, and seems to be more to the right side than to the left It is exceptionally elongated.

On vaginal examination I am quite sure that I can push the tumor up, although it does not fluctuate. I am quite sure, also, that I can map out the body of the uterus, so that it has got to be either a multilocular cyst under tension or some other cyst. When I say some other cyst I have in mind a case I operated upon about one year ago, in which we removed a large tumor from the pelvis which we could not dislocate at first, and even after the patient was put in the Trendelenburg position we could not dislocate it. As soon as we opened the abdomen the tumor disappeared entirely from sight there was no question of fluid or anything of that sort. I put my hand in the abdomen and found it up under the costal arch retroperitoneal, and that it involved the pancreas—a pancreatic cyst. That is the reason why I say some other cyst tumor

You see that this abdomen looks like a pregnancy of fully six months, almost seven, and the mass is more on the right than the left and the way it rises above the umbilicus. The abdomen was shaved last night and is now being prepared by the application of iodin (3½ per cent.) Here is the scar of the appendix operation, and here the scar of her previous uterine operation, and I believe that we will find considerable adhesions if we do not we will be agreeably disappointed. I am making an incision through the midline disregarding the old incision, and I make a liberal incision for several reasons. If this is a cyst, the possibility of its being malignant is very rare and to rupture a malignancy in these days is not surgery It will be far better to make the incision deliberately long and not run the risk of spreading the growth, if one is present P pilloma of the ovary may be highly malignant and again, of semi-malignant character but the tendency is to be malignant This is a m ltilocular cyst and possibly cystopapilloma. Note the multiloculations. So far we are fortunate in not ha ing adhesions, and the cyst delivers easily That is something for an artist—with the full twist of the pedicle from the right to left. As a rule, these cystopapillomata of the ovary are bilateral

This patient has nothing but a small fragment of the ovary here, the remains evidently from the former operation. There is no information concerning that fragment, but you will also see here at practically the midpoint a small band of adhesions, where there evidently was an operation for ventral fixation
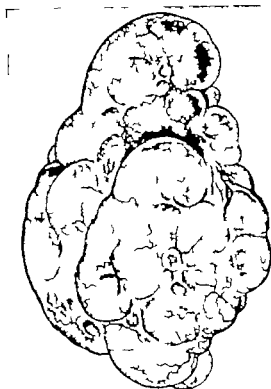

Fig. 114.—Case II. Multilocular cyst. Cystopapillomatous ovary

After releasing the twist in the pedicle we clamp across below the twisted area and cut the cyst free. Now instead of tying this pedicle off *en masse* we sew over the forceps with a non lock stitch not drawing the suture tightly but firmly When we come to the end we release the thread and then quickly draw the slack in our suture Then we retie it in case there is any bleeding

I would like to call your attention to the attenuation of that fixation, how it has failed by a process of time. It forces the uterus into the position from which it was originally intended to separate it. This failure is due in part to the pressure from the large tumor above down upon the uterus. I think with the tumor *out there is no need of shortening that in any way* The uterus appears to be normal. The appendix has been removed with *inversion, no stump remains.* The gall-bladder is normal.

For closure of the peritoneum I am using a No. 2 iodinized catgut, and I will run back with this to draw the muscles together Then with a No. 2 chromic catgut, single strand I will close the fascia. One silkworm-gut stitch for retention, and silk for the skin, using a lock stitch.

The patient has received little or no shock from this operation. The pulse is now 105 regular and of good quality

The anesthetic has been gas for induction followed by ether closed method. There was no preliminary injection of morphin in this case, and you see the anesthetic could not have been smoother. *I use morphin as a preliminary to anesthetics only* in goiters and cases for gas anesthesia.

This patient will be given morphin, grain $\frac{1}{4}$ as soon as signs of consciousness appear and grain $\frac{1}{8}$ thereafter as often as necessary for the next thirty-six hours. Fluids by mouth, preferably tap-water after six hours. Soft diet after eighteen hours if there is no vomiting Enema for distention p. r n., and catharsis as soon as needed after thirty-six hours. Unless the patient runs a temperature *that cannot be accounted for* has pain in or a discharge from this wound the dressing will not be disturbed for nine days. Then the sutures will be removed, and with primary union the wound will be inspected on day of discharge. She will be allowed to sit up on the ninth day get out of bed on the tenth, and go home on the twelfth day

I shall not be a bit surprised if the laboratory reports that specimen as malignant. If it is malignant the prognosis is absolutely good, for *there is nothing in the pedicle at all.* In cases of cystopapillomata of the ovary patients in many instances are prone to live for years.

It was in a case somewhat similar to this that the late Dr Hodenpyl happened to be in the right position to remove the fluid and the patient's improvement was so great that he thought something or other in the way of a serum that was autogenous from the patient might be of value to other cases. For some time subsequently he treated her with serum and at the same time injected her serum into a number of other cancer cases, and, as is the case in all new remedies, these patients became buoyed up very much. They reported feeling better and he began to regard the cases of cancer as cured. Then, after a time, the reports began to come in that the serum was not a success. Just about that time Dr Hodenpyl was taken ill, and when he received the news he was very much disheartened, and I feel his death was hurried by the disheartening news of his supposed cure.

I recall a patient with bilateral cystopapilloma operated upon at Mt. Sinai Hospital six months later the patient was suffering so severely that something had to be done. We brought her down here and removed a cystopapilloma fully the size of a cocoanut from each side That was five years ago and she is still well.

There are other types of cystopapilloma which are exceedingly vicious. I remember one case of a woman thirty-six years of age in the Roosevelt Hospital. She had bilateral cystopapillomata, and each one was about the size of a large grapefruit. She oozed serum as though she had been cut, and was bleeding so that it was impossible to keep the bed clean. We had put some drainage into her over night, and by the next evening the woman was practically exsanguinated from loss of serum. She died at the end of the fourth day

Then we had a woman thirty-eight years of age who had a ruptured ovarian cyst which was a cystopapilloma, in whom I did an operation for intestinal obstruction, and found a mass of fluid a large capsule and a cyst. Eight months afterward she had a secondary deposit along the line of the incision. She died within a period of sixteen months from the time of the rupture of the cyst.

A few years ago I removed a cystopapilloma from a woman sixty-four years of age, and eight years after that she had a cysto-papillomatous secondary growth in the scar of the abdominal wall, which demonstrates the length of time a patient can go without secondaries, and even if they do have secondaries, they may be mild in character

Pathologic Examination.—Gross.—Cyst measures 23 x 20 x 10 cm. and weighs 2300 grams. It is thin walled, translucent, and lobulated by numerous constricting bands on its surface, which is generally smooth. On section, it is multilocular most of the spaces being filled with a thin orange yellow fluid, but in some it is relatively thicker and stringy There are no papillary areas found. The inner surface is pale and smooth everywhere.

Microscopic.—Sections of cyst wall show a smooth outer surface with a wall of fibrous tissue and many irregular septa extending inward, interlacing and enclosing the cystic spaces. Some of the cysts are lined by a single layer of columnar cells, others by flattened cells. The septa contain blood-vessels and are somewhat infiltrated by round cells. There is no prolifera tion of epithelium at any point.

Diagnosis.—*Multilocular cystadenoma of ovary*

The patient made an uneventful recovery wound healed by primary union, and she left the hospital relieved of all symptoms except moderate constipation.

DUODENAL ULCER

This case is one of suspected duodenal ulcer The patient has had pain in the abdomen for ten years, varying in time and intensity The periods in which he is well are longer than the periods in which he is ill. That is one of the usual symptoms in cases of this kind. They have periods from six weeks to four or five months, or longer in which they are well. The distress is from three to four hours after eating varying in character and accompanied by gas. He has been put on bicarbonate of soda to relieve the burning and gas. There is no vomiting except by induction, all of which is characteristic of duodenal ulcer Recently this patient has found that practically any kind of diet upsets him, whereas formerly only certain foods would. One year ago a gastro-intestinal specialist had him x-ray and advised operation.

On February 26th an examination revealed a tenderness over the duodenal zone, and also over the zone of the appendix. Yesterday he had quite a bad period so now without any further examination by the x-ray we are going to do an abdominal exploration.

We make the duodenal incision in the rectus muscle or else between the inner third and the outer two-thirds. We have made our dissection between the inner third and the outer two-thirds of the rectus. The man has a very large ulcer at the duodenum and just a fractional amount of infiltration. There is considerable obstruction, as you will see. That is only one third of the stomach which I have out. A gastro-enterostomy will be indicated here unless we can do a Horsley operation. Sometimes when we anesthetize patients the stomach distends, and it is quite necessary to get rid of the gas. In this man's stomach I would like to get rid of the gas before we do anything. Then we might very readily press down the stomach and we

can very readily bring up the duodenum. The doctor says he was washed out before he came up, but there is evidently a great deal of acute dilatation, or he is taking in a great deal through the esophagus instead of through his lungs.

Now we have a collapsed stomach here, and here is the colon, and here let me show you the prettiest ulcer that has ever been shown in this room. Note the infiltrated area with indentations, and note the vein showing the position of the pyloric sphincter. Now in this ulcer the entire diameter is less than the end of the little finger. This is the type of duodenal ulcer and complications in which we get the best results by doing a gastro-enterostomy. We have an obstructed condition and all we need is to do a gastro-enterostomy. Take and throw over the transverse colon, and we will then obtain a very easy dislocation of the stomach into this opening I am making in the transverse mesocolon. We dislocate the stomach and grasp it with a pair of forceps in the lowermost portion, although it is the highest portion of the stomach as we see it here. We are going to clean off these adhesions, and then by making tension on your transverse colon you will observe at this point the ligament of Treitz, and to the left of it that we have a fixed portion of the duodenum. We will make an anastomosis between the first portion of the jejunum and the stomach from left to right. The next step is to place your transverse colon into the abdominal cavity and bring up the stomach. Cover up the field well with pads moistened with saline. Then we take Kocher clamps and grasp the stomach and intestine. Wall off everything very carefully with sponges, and then we begin our anastomosis by sewing the apposed surfaces of the stomach and intestine together with chromicized catgut. The primary stitch is the ordinary basting stitch. There is nothing fancy about this stitch at least no fancy stitch is necessary. Neither do I make t my particular aim not to sew through the stomach and intestine. People do not die of infection in this operation. They die of pneumonia more than anything else, unless the operation is a bad one. When you come to one end of it wrap the needle twice, and that gives you a knot or a half-knot in your stitch.

Next we cut the opening into the stomach and the opening into the intestine, going about ¼ inch from the point of anastomosis or suture. Now to give you the picture to show you what we have, I will pick up the apposed surfaces of the intestine and stomach at this point. There we have an opening of about 2½ inches in length here is the mucous membrane of the outer wall of the intestine here is the mucous membrane of the upper or anterior wall of the stomach. The appendix lays well down over the promontory against the sacrum and is bound down very badly As long as we have it we will remove it, because the appendix in itself a gastric disturber and is said to be the cause, by means of infection, in many instances, both of gall bladder disease and duodenal and stomach disturbances. I crush the base in every instance that I can in order to obviate the possibility of hemorrhage which results from turning in an open appendix. I am in the habit of crushing and ligating to obviate trouble of that sort. You place a purse-string suture ¼ inch from the base of the appendix, bathe the cut stump with pure carbolic acid and invert it.

Here we have had a large ulcer of the pylorus, and have done a gastro-enterostomy from left to right, and found a chronic appendix which we have removed. This man a treatment will be ¼ grain morphin, Fowler position a Murphy drip of 1000 c.c. containing 1½ ounces of glucose and bicarbonate of soda. He will have nothing by mouth for twenty four hours. If he vomits he will be washed out. Should the pulse begin to climb very fast within a few hours we will know that there is hemorrhage. We have had hemorrhage from this operation about five times within fifteen years.

The abdomen will be closed with plain No 2 for the peritoneum and muscles and chromic No. 2 for the fascia. No drainage used.

The patient made a good recovery no vomiting after operation. Left the hospital able to take all foods except heavy meats with no gastric discomfort.

Pathological examination of the appendix shows chronic appendicitis.

CHRONIC SUPPURATIVE MASTITIS

THE next case is that of a woman forty four years of age who has had a discharging breast for the last two years, and during which time she states she has had thirty-two abscesses. You will see she has a sinus at this point. There are no glands in the axilla and no reason to believe that there is any malignancy except from induration which it is possible to get in septic mastitis, which she has evidently had. Her last child was born two years ago and she had no milk in the right breast. The child nursed only from the left. Two years ago the right breast swelled without discharge for a time, but since then she has had seventeen abscesses in this breast, which were cut. Two days ago it swelled up again, the patient had chills and fever for a time, and then the breast began to discharge. In these mastitis cases occasionally the breast must be amputated, although that is rare. Every now and then we find a case which has come to the point where amputation must be considered and then excision of the breast will cure it. Three years ago I had a case with a number of abscesses actively discharging and the only thing we could do was to remove the entire breast. In some instances the cases are cured after a liberal dissection within two and a half to three weeks. This patient does not present a picture of seventeen abscesses. There are only two scars, but possibly there may be a foreign body left in with one or both of these.

We will not do a radical operation, but will simply lift the breast from the pectoral muscles, unless the tissue looks malignant. It does not feel so. We will remove this breast with the Stewart incision, which begins at the median line or beyond the median line, extending it across the posterior middle portion of the axilla and we will do a very rapid dissection. I will make the incision in the breast. There is a sinus at that point, and something that looks like more pus here. Under ordinary circumstances I would think it was malignant, but there is

nothing at all that looks anything like malignancy There is
absolutely nothing in the glands. But we have a suppurative
mastitis which would never have gotten well without excision
of the sinus itself or excision of the breast. We put in a ½-inch
caliber rubber drainage-tube, and put in three silkworm sutures,
and then sew it up with silk.

This incision of Stewart's is used in removal of the breast in a
radical operation, just as well as it is in operations of this kind. I
have personally done over 100 operations in malignancy and non-
malignancy using this incision. In the first 25 there were a
large number that complained of exceptional pain in the axilla.
Whether we were just anxious about the patients and recorded
pain more frequently I do not know But after the first 25 the
patients did not seem to be complaining of much pain, at least
not as much as in the first 25 The incision is all right for
certain locations of the tumor After that the modified incision
of Meyer and Halstead or the incision of Rodman will give
better exposure, more than does the incision of Stewart. I would
rather do a Willy Meyer Halstead operation than this type.

*Pathologic Examination of the Tissue.—Microscopic —*Sec-
tions from three areas show the same picture. There is degener-
ating fibrous tissue heavily infiltrated by polynuclear cells. The
exudate is so extensive that recognition of fixed tissue cells is
difficult. There is extensive proliferation of endothelial cells.
No mammary gland tissue is seen in the sections.

*Diagnosis —*Chronic purulent mastitis.

Discharged to the out-patient department on fourteenth day
with considerable seropurulent discharge.

CHRONIC CHOLECYSTITIS

THE next patient is a woman thirty-six years of age, with pain in both sides—right high up left lower down. Also backache and pain in abdomen during the night, usually about 2 o'clock in the morning. Has never had pain of great intensity while awake. The pain is usually worse in the evening between 5 and 7 o'clock than during the day but she is bothered much more in the night time. There has been no vomiting. Examination shows patient to be markedly tender over the gall bladder and appendix, and there is a retroposition of the uterus, with slight ulcers of the cervix. I am going to expose her for an appendix and an exploratory gall-bladder at the same time.

In this case there is a possibility of finding a diseased gall-bladder or appendix, or both, and instead of making the incision for a gall bladder or appendix, we make it between the two points, that is, a low gall-bladder incision or high appendix incision, which will allow us to go up or down as the condition demands. In other words, if we see that the gall-bladder is involved, we can extend the incision upward, and if it is the appendix we can extend our incision downward. We will make it in the midportion of the rectus. That will give a free entrance to the gall-bladder for palpating or visualizing, and also for palpating or visualizing the appendix. We will make a Deaver incision. The first thing we do is to examine the gall bladder. It is normal, white, and I do not find any evidence of stones. Unless there are adhesions to the gall bladder I am not going to take it out, so that we will extend our incision upward until we can see the gall-bladder. It is a peculiar pearly gray and has not the appearance of a normal glistening gall-bladder. We have the appendix low down in the pelvis. It is pathologically pink and white, and there are some bands and adhesions also at this point. The first step is to release the adhesions, which are dense in this case. Now I will do a routine appendectomy just as you saw me do in the other cases.

Coming back to the gall bladder we will now proceed to wall off the abdomen with moist pads, so that we can do a cholecystectomy

I remove this gall bladder because of the peculiar pearly gray appearance, which is decidedly abnormal, and the definite history of past gall-bladder attacks. Although there is no evidence of stones here nor has there been any symptoms in this case of involvement of the gall-ducts by stones, I believe the pathologist will report a diseased condition of this mucous membrane, and there is one operation for uncomplicated cholecystitis in this clinic—cholecystectomy. We are getting away from the "Stone Age" in the surgery of the gall-bladder and coming to depend more upon the appearance adhesions, and glandular enlargement about the cystic duct for information regarding the past inflammation and future history. The effect upon the biliary system from removal of the gall-bladder is still unsettled experimentally but we have known for years that removal produces no subjective symptoms.

With a clamp on the fundus of the gall-bladder it may be used as a tractor to dislocate the liver giving free exposure of the cystic duct region. Grasping the hepaticoduodenal ligament between thumb and index-finger of the left hand, with the gall bladder resting in the palm a longitudinal split is made in the ligament, the peritoneal edges separated and the cystic duct dissected free, using the index finger as a guide. By forcing the scissors through the ligament above the duct it is clearly demonstrated to be free, and as the scissors are withdrawn a clamp follows another clamp is applied above and the duct cut across. Using the clamp across the duct as a tractor the artery and vein are dissected free and clamped. Now as I dissect the gall-bladder free from the sulcus my assistant will clamp the blood-vessels as they appear in the peritoneal reflection. The first ligature is applied to the duct, No. 2 iodinized catgut and now from below up we will tie off the branches as they were clamped.

In the majority of cholecystectomies I place a drain of rubber tissue down to the cystic duct, removing it at the end of thirty-six hours. There is no need f a drain in these cases for

infection, but every now and then we see drainage of bile from a ligature slipping, and to save reopening the abdomen in these occasional cases we usually place a small drain in the upper angle. The drain does not interfere with the healing of the wound, as it is removed in thirty-six hours.

Wound healed by primary union patient left the hospital on fourteenth day

Pathologic Examination of Gall-bladder.—*Microscopic*.—Sections of gall-bladder show low rugæ in part, with tips of rugæ stained with bile and some hyperplasia at base of glands, with mucus in the crypts. The stroma is infiltrated by round cells and a few polynuclears. There is increase of fibrous tissue between the muscle bundles and beneath the serosa with round cells, and polynuclears in excess in the blood vessels throughout.

Diagnosis.—Chronic cholecystitis and pericholecystitis.

CLINIC OF DR. WILLY MEYER

LENOX HILL HOSPITAL

THE IMPORTANCE OF POSTURE IN POSTOPERATIVE TREATMENT

WHEN as a young student in medicine I attended the lec
tures of the late well-known Professor Zenker of the University
of Erlangen in the winter of 1877–78 he closed the season s
last address to his class with the words "Remember gentle-
men, prophylaxis, the prevention of disease, is the highest aim
of medicine." These words were indelibly engraved upon my
memory During my entire medical life I have watched with
the keenest pleasure the evolution of medicine and surgery from
this point of view and have followed with the highest admira
tion the incessant, often self-sacrificing work of medical men to
prevent disease in all the branches of our science. I have also
personally tried to do my little mite whenever and wherever
possible and to live up to my esteemed teacher's impressive
words.

What has been accomplished in the way of prevention of
disease is known to all of us and to the world. I will but remind
you of Jenner's immortal achievement, the vaccination against
small-pox, and the now uniformly introduced successful inocula
tion against typhoid fever diphtheria, cholera, even yellow
fever and many other infectious diseases, of which the infecting
microbe has been found and cultured. So the entire apparatus
set in motion everywhere, in private practice and hospital
work, before and during operation, all of what we call antiseptic
and aseptic surgery is nothing but a detailed and determined
attempt, founded on definite scientific knowledge, to prevent
disease, to render infection impossible.

Now just as our endeavors in surgery *pre*-operatively as well as *during* the operation, are important to prevent disease and complicating affections, so must our endeavors be constant *after* the operation, when the patient is being and has been returned to his bed, when after-treatment has begun.

Of the many important factors that here come into consideration I shall at this time pick out just one—"posture. Posture in all its varieties is, to my mind, one of the most powerful means at our command to hasten recovery and avoid complications. Of the various postures introduced into practice I shall this evening consider principally two which I have practised for a great number of years in hospital and private work, alone as well as combined with others—the slight Trendelenburg posture and Sims' posture, or the latter more exaggerated, the abdominal posture.

The Slight Trendelenburg Posture.—When a patient has successfully gone through the immediate dangers of the operation and the first part of the after-treatment, and he as well as all the others concerned in his welfare feel easy and are looking forward to a speedy and uninterrupted recovery there is still one treacherous enemy lurking in the background ready to strike at any moment—venous thrombosis.

This thrombosis usually concerns the left femoral vein, following work done by the surgeon in his every-day routine, also one or more of the pelvic veins after operations on organs within the small pelvis and after childbirth.

From a pathologic point of view such blocking of the venous lumen is not very serious matter The lower extremities and the respective pelvic organs easily stand the disturbance in the normal return flow of the blood to the inferior vena cava. Collateral circulation is plentiful and the concomitant edema of the extremity—though usually at first greatly alarming the patient and his relatives—subsides after a certain time. Its persistence is very rare. Surgeons are used to ligating the deep femoral vein, for instance, in the operative treatment of the so-called thrombo-angiitis obliterans, and no interference with the ordinary circulation is seen. With aseptic healing thrombus forms

immediately adjacent to the ligature and usually extends up to the spot where a lateral branch enters the ligated vein. In phlebitis the coagulation does not remain quite as local. The thrombosis forms as far as the venous wall has become inflamed and more or less edema develops in the lower extremity at least, if the femoral vein is involved. Thrombosis in branches of the internal iliac vein may run on without any external manifestations an unexplainable tachycardia is taken by many as the only outward sign. If the inflammation spreads to the external branch of the common iliac vein, edema of the leg and thigh may become alarming I but remind you of the so-called phlegmasia alba dolens after complicated childbirth.

What medical men fear is the clinical sequelæ of the thrombosis the loosening of a part or of the whole length of the thrombus, which then enters the circulation and is driven as a foreign body through the right heart into the lung What we fear is this sudden pulmonary embolism the sudden interruption of the normal physiologic circulation of the blood between the right and the left heart by way of the lung partially or completely which sets in like a flash from the blue sky and is absolutely beyond the control of the attending physician.

I spoke before of the thrombosis of the left femoral vein. Why only of the left and not also of the right?

It is a clinical fact that at least 95 per cent. (if not 99 per cent.) of thromboses of the femoral vein occur on the left side and if both veins become involved, one after the other that the trouble almost always starts with the left. The reasons for this peculiarity are principally anatomic.

We know from the investigations of the Freiburg pathologist, Ludwig Aschoff that thrombosis occurs in those portions of the venous system in which the flow of blood is retarded provided micro-organisms circulate within the blood

With the patient in the usual horizontal posture in bed after an operation, the upper part of the body from the hips up being supported on pillows, there is no place in the body where venous

Aschoff, von Beck, de la Camp, Kroenig, Beiträge zur Thrombose-frage Leipzig, 1912.

circulation is more impeded than in the groin. Poupart's ligament, often strained presses upon the femoral vein as it runs across the horizontal branch of the pubic bone. From here on the blood has to run uphill in order to reach the inferior vena cava. Further up on the left side, the right common iliac artery or the lowest portion of the abdominal aorta crosses the common iliac vein in front of the spine, whereas on the right side
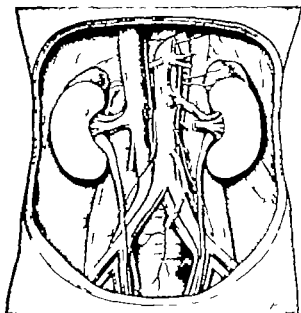
Fig. 115.—The anatomic relation of the crossing of the left and right iliac veins and arteries. (From Habhmann Anatomy.)

the external iliac vein passes underneath the external iliac artery a much smaller vessel, in order to reach the common iliac vein and inferior vena cava. Here also the soft belly of the psoas muscle forms the pillow on which these vessels run. The difference in the circulatory arrangement of the right and left sides is due to the anatomic fact that the inferior vena cava runs

nearer to the median line than the abdominal aorta (Fig 115) Further before the common iliac vein reaches the place where it has to pass under the strong and ever-pulsating common iliac artery the sigmoid flexure of the colon, usually filled with inspissated fecal matter rests upon it for quite some distance.

These factors have been accused as being principally responsible for the clinical fact that postoperative femoral thrombosis is almost exclusively met with on the left side. It is, of course, possible that in addition to these anatomic conditions minor factors often come into play in its development. Repeatedly I have been asked when speaking on this subject before my assistants and students, why has not this complication been seen more frequently in medical cases which have been helpless and bedridden for many months, why principally in patients that have been operated upon? My reply has been that the ordeal, which we call operation, opens up a great many ports of entry through which microbes may reach the circulating blood current. It takes time, likely a few weeks, before the slowly recuperating system gets rid of them. Usually it is the second week after operation in which the thrombosis of the femoral vein occurs.

Besides, the effect of the general anesthesia may contribute to thrombus formation. It will be interesting to watch and observe, whether regional and local anesthesia, employed now a-days in so many major and minor operations, will reduce its occurrence.

Weakness of the heart muscle is also to be considered in the etiology of thrombus formation.

Fortunately femoral as well as pelvic thrombosis, as such is rare. Yet, I am sure, every somewhat busy surgeon has met with it. And whoever has gone through the worry and annoyances it has produced, particularly in private practice, will never forget it. Very vividly stands before my memory an experience of one of the first years of my surgical practice. I had been called to operate upon a case of acute appendicitis in a private residence, and had to go ahead at midnight. The patient was the only daughter in fact, the only child in the

family Everything went well at first, and in the beginning of
the second week, when asked again concerning the prognosis,
I expressed myself as very sanguine and extended the hope that
the patient would be out of bed a few days later During the
following night she complained of pain in the left groin, which
increased from hour to hour in spite of an ice bag immediately
applied. Soon the leg began to swell, and a typical femoral
thrombosis developed. Not long after the femoral vein on the
right side followed suit. It was more than six weeks later before
I dared to allow the patient to be out of bed. The people I had
to deal with were very nice still, I sometimes felt that they
blamed me for the complication.

On looking back, several cases of thrombosis re-enter my
mind which occurred during the first two decades of my forty
years of continuous surgical practice. I have seen it after the
most aseptic surgical interferences as well as after operations
for acute intra-abdominal inflammations. I have seen left
femoral thrombosis set in after an operation for hernia after
the radical operation for cancer of the breast, also subsequent to
operations for acute appendicitis and perityphlitic abscess, fol-
lowing suprapubic cystotomy etc. Never can I forget when the
father of a well-known colleague here in New York, after a supra-
pubic lithotomy done by me at his home, developed a left fem-
oral phlebitis which evidently gradually extended farther up
into the iliac vein. It was many weeks before the pronounced
swelling of the lower extremity began to recede somewhat. A
marked difference in the size of the two lower extremities per-
sisted he had to wear a rubber stocking that reached almost up
to his hip and required special suspenders to prevent it from
slipping down, a procedure which proved to be a great hardship
for the patient. Barely two years later he died suddenly with
symptoms of a pulmonary embolus.

On one occasion when I was visiting a semiprivate patient
of mine at the hospital I saw his roommate, who had been
operated upon by one of my colleagues for a stone in the kid-
ney drop dead upon his first attempt to walk to the window f
the room. Naturally all concerned in the case were tterly dis-

tressed. Autopsy showed an embolus riding on the bifurcation of the pulmonary artery

I could cite other cases of the same type, as vivid in my memory as if they had occurred today The fact that I have also seen patients with a pulmonary embolism recover under my hands might be worth mentioning, but does not fit in the realm of the present discussion.

So much is sure, and I wish to repeat it, whoever has met with this complication in practice, striking as it does so suddenly and with unexpected deadliness later on after operations, when the patient may be up and about again and ready to leave the hospital or sick room will never forget it.

No wonder that it has excited the interest of many medical men! No wonder that it has been thoroughly investigated and frequently discussed! I myself wrote a brief paper on the subject twenty years ago [1] and have always tried my utmost to prevent its occurrence in my patients.

Can it be prevented? Yes. I believe it can perhaps not absolutely but surely reduced almost to a minimum

It stands to reason that if we can overcome the normal anatomic impediment in the circulation of the lower extremity at Poupart's ligament and further up in the pelvis, the principal cause for the formation of a phlebitis and therewith of a thrombosis would be successfully met. This we are able to do Just as we allow our automobile to run faster before we approach a hill right ahead of us, and then see it climb up usually without changing the gear in the same way we can make the blood current in the femoral veins faster and thereby for the blood the ascent from the lower extremities to the right heart easier *if we raise the lower end of the bed* that is to say if we arrange for a slight degree of Trendelenburg's posture (Figs. 116 117) Blocks placed under the foot end of the bed (Fig 118) will allow the blood within the lower limbs to run down hill from the toes

to the hips, and in its onrush it will easily reach the veins in the
upper pelvis, nay I am sure, often the region of the renal veins,
from where the negative pressure existing in the thorax, the
suction of the right heart, will substitute the decreasing velocity
of the blood current.

I am absolutely convinced that this simple means of raising
the lower end of the bed is the most powerful weapon we possess
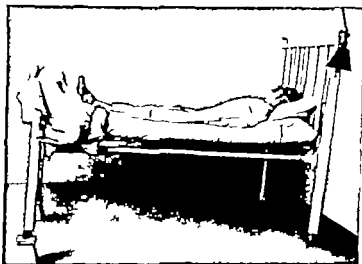
Fig 116 —Slight Trendelenburg posture with patient on his back,
resting   This is the standard posture for all patients operated upon below
the level of the heart; also for weak patients, operated upon head or neck,
who cannot get up early

of preventing the occurrence of femoral (and pelvic) thrombosis.
I am using it after every case of operation at or below the level
of the heart, in weak patients also after operations on neck and
head, if they stay in bed for some time, and can truthfully say
that I have not seen the typical thrombosis of the left femoral
vein occur since I started doing this. In my paper on this sub-
ject, already alluded to, I mentioned that it would be interest
ing indeed if experience would show that by such raising of the

lower end of the bed the occurrence of femoral thrombosis could really be prevented that is to say if we found that the complication occurred only in such cases where this prophylactic measure was omitted. Today I can state that this proof has been rendered.

Last year for the first time in many years, after a cholecystectomy I saw a patient already out of bed two weeks after operation, suddenly and unexpectedly die under the unmistak
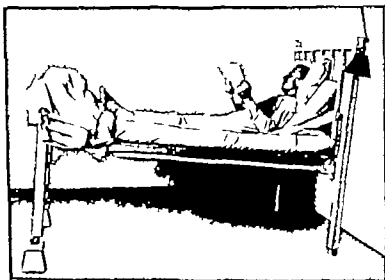
Fig. 117.—Same posture 9th patient wake, his attention being engaged otherwise. There is no reason why the upper part of the body should not be raised on pillows at the patient' convenience.

able clinical symptoms of pulmonary embolism. She had made a smooth recovery except for pronounced postoperative vomiting and had been treated as usual with elevation of the lower end of the bed. Unfortunately the family would not allow an autopsy much as I tried to get permission for it. Therefore I cannot prove the correctness of the diagnosed cause of death. Still the tragic suddenness of the exitus in the midst of seeming well-being and the immediate marked paleness of the face spoke

for it. The patient had had a number of children and may have harbored in her pelvic veins a thrombus for many years. She had not developed a femoral thrombosis during the after-treatment.

I would like to cite another case illustrating how a prolonged Fowler's posture can favor femoral thrombosis. As will be mentioned later on, I am in the habit of treating my patients
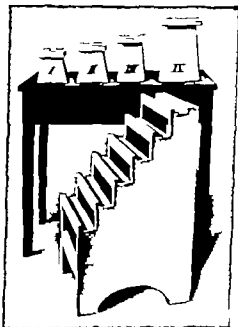
Fig. 118.—The four sizes of blocks and "the steps," as used for elevation of head or foot end of the bed, the Lenox Hill Hospital, New York. The height of the blocks is respectively 5, 6, 7, and 10 inches.

with resection of the stomach and gastro-enterostomy with a slight Fowler's posture during the first few days after operation. A lady of forty, in whom I had resected a cancer of the stomach that had developed on the basis of an old ulceration according to Billroth's operation No. 2, liked the posture very much, and begged to remain in it longer than the usually allowed three days. Just at that time I had to leave town for a few days, and

thus it occurred that she had the head end of the bed raised on blocks for ten days. At about that time she began to complain of pains in the groin and tenderness over the left femoral vein. She soon also developed some edema of the extremity. Of course, the position of the bed was quickly changed but the annoying symptoms of the femoral thrombosis lasted longer than any other sequelae of the operation.

I would also like to mention an observation recently made in 2 patients, one after posterior gastro-enterostomy for duodenal ulcer the other after an operation for a gangrenous appendix. In both cases a painful swelling occurred in the soft parts of the left leg accompanied by fever and tenderness over the calf, which developed two to three weeks after the operation, and could not be diagnosed otherwise than representing a deep-seated localized phlebitis between the muscles of the calf. In both the lower end of the bed had been elevated continuously since right after the operation. Both patients got well after about two to three weeks without any further untoward symptoms.

A third case of the same type I saw recently in the practice of another colleague. He, too got well.

The favorable preventive effect of 'posture' has for many years been methodically assisted in every one of my operative patients by frequent motions, particularly of the left lower limb—I call it 'bicycle riding in bed'—and by deep and frequent breathing exercises during the first one to two weeks after the operation. This latter addition I consider particularly important.

As stated already it is possible that other factors may play a rôle in the development of venous thrombosis besides the usual horizontal posture of the patient in bed for instance, the anesthetic. It is a fact that in some patients the expiratory air still smells of ether or anesthol on the second or even the third day after the operation. It stands to reason that the elimination of the anesthetic from the system by way of the blood in the lungs

Many colleagues are inclined t order levation of the affected extremity on pillow in such case Personally I do not consider such treatment of femoral thrombosis as good or as effective as the elevation of the lower end of the bed.

will occur more quickly if we insist on regular slow frequent, and deep breathing exercises immediately after operation and also later on. In the first days the anesthetic will thus leave the system faster later on, the methodic breathing, done principally under the supervision of the attending nurse, may prevent pneumonia particularly in the old. None of us ventilate our lungs sufficiently The reason is that we have too much lung—five lobes. The exchange of gases physiologically necessary to sustain life can well be sustained by superficial breathing. Were it not for an occasional sigh or a hearty sneeze many of us would not breathe deeply for months. Yet what a sensation of comfort and satisfaction is produced by a deep inspiration. Just think of our vacation time, gentlemen, when we stand on the deck of an ocean greyhound or float in a boat on one of the mountain lakes, how thoroughly every one enjoys the benefit of a deep inspiration! We should also enjoy it in the midst of our busy lives. Just pause and breathe deeply There certainly will be less chance for atelectasis. By all means we all should make it a point to instruct our patients who have been operated upon to practice methodic deep breathing

In weak patients and also after severe intra-abdominal and intrathoracic work I have added for many years to the precautionary methods, already alluded to, a prophylactic subcutaneous stimulation of the heart muscle by means of camphor caffein, digalen, or digifolin etc. beginning methodically immediately after the operation and continued for a number of days. Later on the same medication by mouth is resorted to.

I certainly can truthfully affirm that femoral thrombosis is unknown in my division in the hospital and also in my private practice since the strict and methodic application of the just mentioned procedures have been practised by me during the last twenty years.

Sims' Posture Alone, and in Combination with Fowler's and Trendelenburg's Posture—Gentlemen, I hope not to tire you if I still talk briefly of the most beneficial effect of another posture which I have been using in postoperative treatment of my patients for many years, that of Sims (Figs. 119 120) Of the

postures that are at our disposal, during and after operation, Sims posture is surely one of the most useful I know of

Personally I believe that a case of acute gangrenous appendicitis, with its frequently present seropurulent or purulent effusion into the peritoneal cavity fares best if the abdomen is drained with the help of Morris cigarette drain, which carries
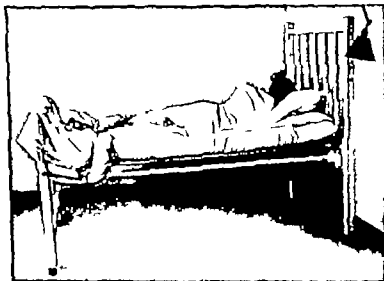
Fig. 119—Typical Sims posture, both arms of the patient pointing forward. hile he rests principally on his right shoulder His lower leg is kept straight, while the upper is flexed t hip and knee-joint, the latter touching the bed. It contributes to the patient comfort to place pillow crosswise bet een the knees

a rubber tube in its center or has an additional entire or lengthways split drainage tube—I call the latter a *gutter drain*—attached outside. I put this drain into the lower end of the usually practised pararectal incision down to the bottom of the small pelvis and close the wound by layer sutures I also place one or two stitches below the drain in the lower angle of the peritoneal, fascial, and skin wounds, so that after removal of

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far as cholecystectomy is concerned that it is for the best interests of the patient if we start the removal of the gall-bladder from the fundus toward the cystic duct and not in the opposite direction. Just look at the beautiful illustrations given to the profession by Eisendrath of Chicago exhibiting the great variety of anatomic relation between the cystic artery and the bile-ducts, also the great variety in the course of the cystic duct with regard to the common. No one can foretell whether any one of the many anomalies is present in the case just at hand. A good exposure of the junction of the cystic and hepatic ducts will show clearly the fascinating anatomic relations. It will also permit the surgeon to place the ligature close to the common duct and thus render absolutely impossible the re-formation by nature of a smaller gall-bladder after cholecystectomy which some surgeons claim to have observed. Starting the excision of the gall bladder from the fundus usually means more bleeding in the gall-bladder bed. It is quickly and easily controlled—best, to my mind—by an aseptic gauze tampon which during the operation is compressed by a blunt retractor held by the second assistant and which later on together with the cigarette drain, that is introduced down near to the ligated cystic stump, is surrounded by a piece of rubber-dam to prevent adhesions. These three items form my way of drainage after cholecystectomy.

If now we place the patient in Sims' posture immediately after he has reached the bed—or better still, when he is lifted from the operating table on the stretcher to be removed from the operating room and wheeled back to his bed—the bottom of the small pelvis after an operation for perforative appendicitis and the cystic duct-stump after cholecystectomy is the highest point of the drainage system inaugurated and not the lowest. Blood-serum, wound secretion, often also bile from the gall-bladder bed or a leaking cystic stump will now run down hill to the outside over the shortest route possible, not uphill. I insist on the continuance of this posture for the first eighteen to twenty hours when a slight turning of the body to the left is permitted. On the third day after the operation the patient may permanently take the usual position on the back that

the drain, mostly in the course of the third day after operation, the buttonhole in these tissues can easily close.

I am absolutely opposed to closing up the patient's abdomen after removal of the gall-bladder. I believe the surgeon has not the right to take chances with his patient's life for the mere pleasure of seeing the abdominal wound heal by primary union throughout or for the sake of simplifying the im-
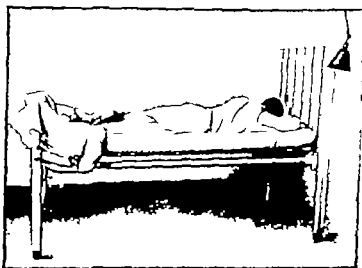
Fig. 120.—The same, sick patient resting on the upper part of his chest and one arm more or less extended back and. This posture is less comfortable and is made use of exceptionally and for short period only; should the patient get tired of the usual one. If the desirability of the lateral posture seems less pressing, he'll be more satisfied. Even tired, if allowed to be turned temporarily more on his back.

mediate after-treatment for the patient as well as for himself. One hundred consecutive patients with a cholecystectomy wound closed up by air and water-tight may recover smoothly and the hundred and first may die for no other reason than that the abdomen was not drained, if the ligature on the stump of the cystic duct gave way and bile-containing microbes suddenly entered the closed peritoneal sac. I am furthermore of the opinion so

I proceed in exactly the same way if in addition to chole-cystectomy the hepatic or common duct is to be drained, or if gall-bladder and duct require drainage.

Another operation which in its immediate results is, I think, greatly benefited by Sims posture is gastro-enterostomy In posterior gastro-enterostomy I always join the short loop of the jejunum to the stomach in such a way that the current in both organs runs in the same direction. What is then more
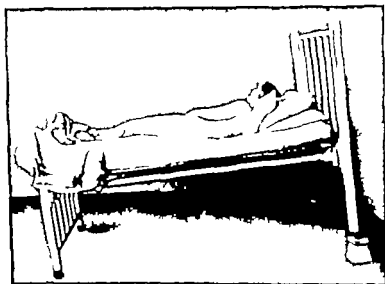
Fig. 122.—Sims and slight Fowler' posture combined during the first three days after gastro-enterostomy

plausible immediately after a posterior gastro-enterostomy than to turn the patient into a not too exaggerated right Sims posture and at the same time to slightly raise the head of the bed? (Fig 122) I know from experience that the patients like this position. Although later on in the after-treatment I often re pent to them that they may well stay on the back, I find the majority of them favoring the right lateral posture. Certain it is, that I see very little if any vomiting after my gastro-enter

means at a time when the principal normal wound secretion has ceased. During these first few days the foot end of the bed is not raised because we all like to avoid having any wound secretions sag toward the subphrenic space from where absorption into the general circulation is favored. At the end of the third day the foot end of the bed is raised on blocks (Fig 121)

It is my belief that by looking ahead and always considering "safety first" to be the solemn duty of the surgeon, the majority of the patients will do well under this treatment after chole-
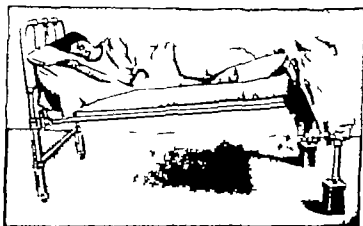
Fig. 121 —The same front view. The patient is made to take this posture again for bout two to three hours, but the various parts constituting drainage are removed in relays, commencing one week after operation.

cystectomy The statistics of many individual men now-a-days show that of 100 patients with interval operation for appendicitis and also for acute appendicitis—the latter being done within the first twelve to eighteen hours after the onset of the attack— 100 get well. Similarly we see of 100 cholecystectomies 98 (if not 99) recover A death is usually due to an accident. I believe that drainage aided by Sims posture, and later on by slight Trendelemburg posture if generally adopted would con tribute to make such results universal.

until the patient gets up. As soon as he is allowed to be up and move about the blocks are removed and the normal horizontal position of the bed is resumed. I am never influenced by the requests of the patients to change these tactics. To questions of why I insist on the posture, I reply with the statement that I am willing to tell them when they are ready to leave the hospital. To many I have had to explain the "why" later on; others forget to ask about it again.

Only temporarily is it allowed to put the foot end of the bed down; that is, in those exceptional cases where some difficulty is experienced in urinating when the foot end of the bed is raised; often the same patients are also unable to void in the horizontal posture, but some certainly can easier relieve themselves if the bed is lowered. To allow the bladder to distend as much as possible I have always found to be a splendid policy. In my division we defer the postoperative use of the catheter as long as possible, especially with the male, without, however being too hard on the patient. I cannot agree with those surgeons who demand catheterization if the patient has not voided within eight to ten hours after operation. Now and then we could well temporize until thirty to thirty-six hours after operation, when the patient urinated spontaneously and then passed only 350 to 400 c.c. Why use a catheter for such a small quantity which frequently did not bother the patient to carry in his bladder in the midst of well being! After all, catheterization, no matter how carefully and how aseptically done, means for the patient—at least for the male patient—an additional interference which if avoidable means another asset for him.

I have before mentioned Sims posture combined with a slight Fowler's or Trendelenburg's posture. I am very much in favor of combining postures, and let the degree depend upon the amount of infection and extension of the intraperitoneal effusion. We all recognize the great service the late and much lamented John B. Murphy has done to suffering humanity with his systematic rectal instillation, the patient being in an exaggerated Fowler's posture, in cases of general septic peritonitis after intra-abdominal perforation of any sort. Special beds, very

ostomies. Whether or not this is partially due to the posture, I am not quite ready to decide although I believe it is. An important contributing factor is that for years surgeons have practised the attaching of the stomach and not of the jejunum, to the rent in the transverse mesocolon. The so-called and much dreaded "vicious circle" is no longer seen.

Remembering that a thrombosis of the left femoral vein—should it occur—makes its appearance not earlier than the
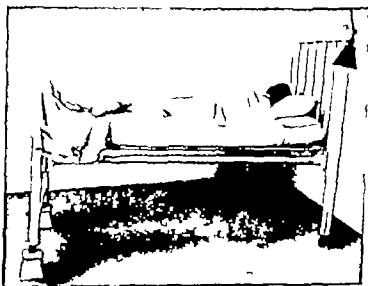
Fig. 123.—Same and slight Trendelenburg posture combined, as used later on after gastro-enterostomy the degree of lateral posture as well as the raising of the upper part of the body being left to the patient convenience.

second week following the operation, I never keep the head end of the bed on the blocks longer than up to the *third day*—at the utmost up to the fourth day—after the operation, the time peritoneal secretion ceases. *The assistants and nurses know that by that time the blocks have to wander under the foot end of the bed* (Fig. 123).

I insist on continuing keeping the foot end of the bed raised

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useful ones indeed, have been constructed to make this posture comfortable and practical. Usually we can get along with a simpler arrangement. In cases of this type, if we drain at the same time I have for years been in the habit of combining Sims with Fowler's posture. If the lower abdomen and small pelvis was found filled with infected fluid, particularly after perforation of a gangrenous appendix or gall-bladder a duodenal or gastric

Fig. 124.—Abdominal posture combined with Fowler' (blocks No. 4 oder the head of the bed) in cases of intra-abdominal perforation of any sort with large effusion, both lumbar regions and the small pelvis being drained through intramuscular stab wounds on both sides.

ulcer the perforation in the latter occurring shortly after meal, we make a stab intramuscularly in both groins introduce through it a drain into the small pel is and the respective lumbar region, and then turn the patient right upon his abdomen, t the same time raising the head end of the bed on the highest blocks (Figs. 124 125) I feel sure that the convalescence and recovery of some of these patients has been greatly favored by this procedure

In this connection I must still briefly discuss the claim that the right Sims posture employed immediately after operation, with the patient slowly recovering from the anesthetic, favors the appearance of a postoperative pneumonia, which latter complication is so often seen affecting the right lung. I do not believe in the correctness of such an assumption. During all my experience, particularly in former years, I have kept old patients after suprapubic cystotomy or prostatectomy with drainage of
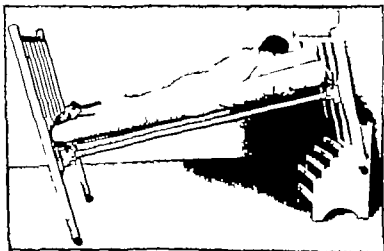
Fig. 125.—The same posture, increased, the upper part of the bed raised on the steps.

bladder and prevesical space in the Sims posture, without remembering to have seen pneumonia more readily appear in its wake. It is true the order given in these cases always has been to change the posture from right to left, or vice versa, every six to eight hours. However it has often happened in the course of the first day that the patient desired to remain on his right side—provided this happened to be the first in which he had been placed—yet no pneumonitis was observed. On the contrary if combined with early breathing exercises, beginning as soon as

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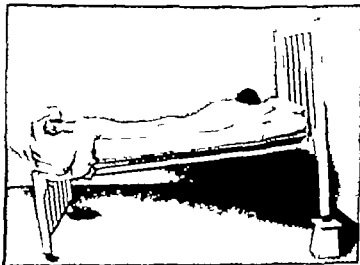
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the time of the patient's return from the operation and then continued in bed, does not favor the development of pneumonia, but will rather prevent it, I would mention that I have been told that one of our large city hospitals has adopted this posture immediately after operation as a routine and has since observed a great reduction in the occurrence of the much-dreaded post operative pneumonitis.

Gentlemen I would like to continue speaking on this most interesting subject, but my time is up   I have no doubt that many surgeons, here and abroad, have observed these measures to the advantage of their patients, as I have done for a great number of years. What I wanted to bring out is, that methodic insistence on certain postures in postoperative treatment will often enable us to avoid the eventual occurrence of serious complications.

'Prophylaxis, the prevention of disease is the highest aim of medicine."

the patient comes out of the anesthetic, I think that only benefit will accrue from the arrangement discussed

As already mentioned, I have gone even a step further in the course of the last three years, commencing the Sims posture *immediately after operation* viz., while the patient is still in the operating room. In January 1918 I did a posterior gastroenterostomy for duodenal ulcer on a private patient. The anesthetic was given by a specialist who is rightly considered an authority in this line not only in New York and our country but the world over On the trip from the operating room down the elevator to the respective floor of the private building with the patient lying on his back on the stretcher he vomited the bloody contents of his stomach so suddenly and in such quantity and evidently unfortunately coinciding with an inspiration, that even the usual, most careful vigilance of the accompanying anesthetist could not prevent the partial flooding of the trachea and upper bronchial tree. It required quite some continuous careful attendance before free respiration was restored, not to speak of the anxiety endured before we knew definitely that an aspiration pneumonia would not likely set in. Later discussing this occurrence with the colleague in question, we came to the conclusion that it would certainly be best for the patients interest if when they were being lifted from the operating table they were placed *immediately upon the stretcher scoops* in the Sims posture, this to be continued in the bed. We felt that then aspiration of the stomach contents, however small in volume, could not occur because everything regurgitated from the stomach would, on account of gravity have to flow to and out of the lower angle of the mouth.

The same holds true fo stomach lavage, postoperatively in cases of acute dilatation as well as persistent vomiting or ante operatively as for instance, in retroperistalsis due to intestinal obstruction. Here Sims' posture combined with a slight Trendelenburg posture is a most valuable preventive of aspiration into the lung

To prove the correctness of the above contention that immediate postoperative Sims posture arranged on the stretcher at

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PNEUMOCOCCUS PERITONITIS

PNEUMOCOCCUS peritonitis is a very interesting condition and while not very common, presents very important problems in etiology diagnosis and choice of treatment.

The disease is probably more frequent than would be indicated in the literature if we include, as we must, only cases verified by bacteriologic examinations, as probably in many cases no attempt at bacteriologic examination is made, or is done so imperfectly as to be valueless. All authors speak of the difficulty of diagnosis. This view we do not share, as there are certain striking features of this condition which should put us on our guard. The 6 cases here reported on the First Surgical Division of the New York Hospital and a study of the reported cases bring out certain features.

In the typical acute cases we are dealing with young children, mostly girls.

The onset in most cases is typical of an acute peritonitis. The vomiting is irregular but not persistent. The temperature, pulse, and respiration are usually quite elevated. Physical examination shows an obvious and usually generalized abdominal distention but the tenderness and resistance much less marked than one expects with the combination of these symptoms. The patients, while obviously acutely ill, are in pretty good condition much more so than is seen in peritonitis from appendicitis at this stage. All show a certain characteristic hebetude

local manifestation of a general septicemia. Probably it is always that.

Pneumococcus peritonitis is found in two forms. First, the diffuse second, the encysted. These forms may represent different types or varieties of the disease or they may represent different stages of the disease. This is yet to be demonstrated.

"When the peritonitis is encysted the prognosis is good spontaneous recovery may take place in one of several ways. Operation results in a high percentage of recoveries (86 per cent.)

"When the peritonitis is diffuse the prognosis is bad—death is the rule. Operation results in very high mortality (86 per cent. In some series 100 per cent.)

"We recognize a symptom syndrome which should make diagnosis reasonably certain in typical cases.

"Operation should not be performed in the diffuse form.

"Operation should always be performed in the encysted form.

"The above represents the sum total of our present-day knowledge of this subject as set forth in the literature to date.

"While I have nothing new to add to this subject, I feel that I may be performing a service by propounding certain questions which have not yet been answered. The satisfactory solution to some of these questions would go a long way toward improving our treatment of this disease.

CERTAIN POINTS OF INTEREST AND IMPORTANCE WHICH ARE YET TO BE CLEARED

1 Why is the disease most common among children?

2. Why is the disease more common among girls than among boys?

3 How does the disease invade the peritoneum?

4 Is there a local port of entry?

5 Is there always septicemia?

6. Will the blood always show pneumococcus If not in what per cent.?

7 Is the secondary form caused by blood infection?

8 Why is diarrhea so frequently a symptom?

9 Is there commonly an enteritis?

a few minutes after disturbing the child by palpation it will go to sleep quietly. *Some of these cases will show a herpes labialis.* A certain duskiness is also described by many authors.

Given the above facts, one should certainly think of pneumococcus peritonitis, especially as appendicitis is not very common in young children. Typhoid fever the other condition to be thought of, is also rare in small children, and the hyper leukocytosis of pneumococcus peritonitis contrasts with the leukopenia. It is more difficult to eliminate a pneumonia.

At operation the diagnosis should also be possible. We find a large amount of fluid with the relative mildness of the peritoneal irritation, much less than in appendical peritonitis, the color of the fluid pearly or milky white, total absence of colon bacillus smell. Then the signs of peritoneal irritation and agglutination of coils of gut are not localized. The appendix may share in the general irritation of the peritoneum but one notices no gross structural changes.

Syms (Annals of Surgery March, 1918) reviews the subject of pneumococcus peritonitis very elaborately. Since that time a certain small experience has developed regarding the types of pneumococcus involved otherwise, we have no findings to offer which either controvert or add to his conclusions except the question of treatment, in which we differ from his views and the majority of those who have considered this subject.

We quote verbatim the conclusions reached by Syms

"Idiopathic peritonitis does occur

"Pneumococcus peritonitis is a rare disease. Netter found it twice in 140 cases of peritonitis bacteriologically examined. In *104 pneumococcus infections in adults* he found no case of peritonitis in 47 such cases in children he found 1 case.

"Pneumococcus peritonitis particularly affects girls. Under fifteen years of age the proportion is 3 girls to 1 boy

"Pneumococcus peritonitis may occur. First, as a single lesion, *i. e.,* alone. second, as a sequel to some other site of infection, as the lung, pleura, etc. third it may be followed by invasion of other localities, lung, pleura, etc. fourth, it may be a

This article contains twenty references in the literature.

"Whether the diffuse peritonitis cases with extreme toxemia represent a distinct type and are caused by a strain of pneumococcus of extreme virulence (Group III) remains to be proved. It is a matter of the greatest importance and should receive the fullest possible investigation. For this purpose bacteriologically our peritonitis cases should be subjected to the most intensive study

"Serum therapy should have the same place here as it has in the treatment of pneumonia.

"The questions as to the chlorids yet remain to be investigated and answered.

Etiology.—The etiology of this condition and the portal of entry of pneumococcus remain an unsolved problem. We can offer no views of our own. One is tempted to think that in some patients the peritonitis is postpneumonic, the original condition having been mild or having pretty well cleared up when the patient comes under observation. Naturally the frequency in girls suggests the pelvic viscera. Why the disease affects chiefly young children we have no good explanation.

Symptoms.—The duration of symptoms before coming to operation is variable. Usually the onset is not very acute and the progress not very rapid. The symptoms are mostly abdominal pulmonary being either absent or mild. These are not incompatible with mild pneumonias in children.

Vomiting is generally noted, but not so typically as is usual in progressive peritonitis. Diarrhea is mentioned about as often as constipation. Torpor or hebetude of some degree, the manifestation of an intoxication, is a constant sign and the patient presents a picture of general malaise. Chills are exceptional as they are in the pneumonias of children.

Abdominal pain is a constant manifestation and begins early. It tends to be constant and progressive. It is earliest referred to the lower abdomen rather than the upper. With the progress of the disease it is referred to the whole abdomen. On physical examination we note distention of the abdomen with tenderness to palpation and rigidity of the muscles but the tenderness and resistance do not seem to be marked as one

10 Do the diffuse and encysted forms represent types of the disease, or do they represent stages.

11 If they are two different types of the disease, are they caused by different types or strains of pneumococcus.

12. Have pneumococci been classified in this and in other lesions, as they have been classified in pneumonia?

13 What can we hope from serum treatment in this disease?

14 Are the chlorids diminished in pneumococcus peritonitis as they are in pneumonia?

15 Will the administration of chlorids show the same benefit they have shown in the treatment of pneumonia?

"Before closing I will touch briefly upon some of these questions. The first four are really of academic interest, and will undoubtedly be answered more or less completely as time goes on.

"5 6 and 7 may be covered by one answer There is undoubtedly always a bacteremia the peritonitis is really a local manifestation of a systemic infection When peritonitis is secondary to some other lesion, as pneumonia for instance, the disease doubtless reaches the peritoneum through the blood-stream. Undoubtedly the blood should always show the presence of pneumococci. I cannot do better than to again quote the words of my friend, Doctor James G Dwyer to whom I put this question

"The disease probably gains access to the peritoneum through the blood. It is probably always a bacteremia, the organisms circulating through the blood and localizing in the peritoneum. Blood-cultures if taken often enough, at the proper time and sufficient blood drawn would be   valuable method of diagnosis on this point. A negative blood finding would have no meaning as the mechanical and bacteriologi reasons of why we get negative blood cultures when we should get positive hold good here. Blood-cultures should show   bacteremia.

"10 11 and 12 may similarly be expressed in one answer Thus far the pneumococcus in its relation to peritonitis has not been systematically studied as it has in its relation to pneumonia, though some investigation along this line was made by Michaut many years ago.

are computed on the Standard Chart described by Gibson in the Annals of Surgery April 1906 According to the views then formulated the direction of the line joining the two records—total leukocytosis on one side, percentage of polynuclears on the other—has some bearing on the body resistance to infection

Spreading infections and infections that meet little resistance should give a rising line localized or well-borne infections, a line which tends to the horizontal or points downward. The accompanying table shows two interesting features—the unusually high leukocytosis seen in the bulk of these pneumococcus peritonitis cases and the sharply descending line in all but the one fatal case.

Examination of the blood by culture is variable. We have no data regarding the early appearance of the bacteria and only imperfect data as regards its disappearance in the cases remaining under observation When both the blood-culture and the culture from the peritoneal fluid have given definite results as regards grouping under the four types of pneumococci they have agreed. While in all our cases we have obtained a culture of the peritoneal fluid, we have only data on the blood-culture in Cases III, IV, V and VI. Cases IV and V sterile. Cases III and VI showed pneumococcus.

Clinical Types of Pneumococcus Peritonitis.—Most authorities speak of a localized type and a generalized type and usually conclude that the localized type is the end-result of a generalized type. Some cases in the literature have been reported of operations consisting in the evacuation of a well-defined localized abscess rather than an actual peritonitis. Most authorities recommend giving the generalized type expectant treatment in the belief that operation at this stage is usually futile or attended with very bad results, and it is better to wait for the manifestations of a more localized type. To this view we cannot give our assent.

Treatment.—Shall we operate. If so when and how? Obviously the thought occurs that if the pneumococcus peritonitis represents a localization of a general process there should be a reasonable probability of the condition getting well spon-

should expect in relation to the other symptoms, particularly the distention and the elevation of pulse and temperature.
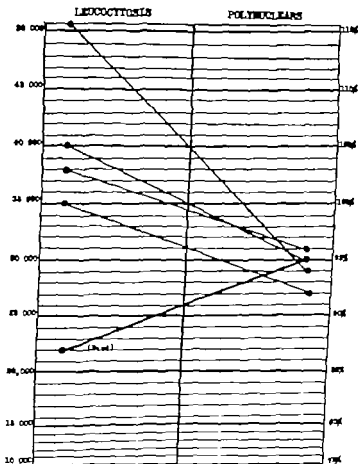
Fig. 126.—Differential count in 5 cases of pneumococcus peritonitis.

Pulse and temperature run high and are typical of an acute peritonitis.

Blood examination (Fig 126) is a tabulation of the differential counts made before operation in 5 of our cases. They

Summary —Pneumococcus peritonitis is an acute infection occurring in children and particularly girls.

The relationship of its incidence to a pre-existing pneumonia is not established but probable in a small proportion of cases.

Patients show the usual signs and symptoms of an acute and extensive peritonitis, but do not seem as sick as usual and the tenderness and rigidity are also less marked. There is a drowsiness or torpor which is constant. Herpes labialis is seen frequently and is believed to be a valuable diagnostic sign

Operative findings are typical—large amount of free milky fluid, absolutely odorless. There are no focal manifestations The peritoneal reaction is less marked than customary with so much exudate.

Treatment recommended is operation at any stage, with pneumococcus serum during the convalescence. Type I serum given until the exudate and blood-cultures demonstrate the presence of one of the other strains.

Operation will consist in median laparotomy with exploration of other focal sources of peritonitis. The fluid should be completely evacuated by suction and a temporary rubber drainage-tube led into the pelvis. Closure of the wound and usual after treatment, particularly Fowler's position

It is our belief supported by our own experience that the mortality should not be high, contrary to the generally expressed belief of other authors.

Case L.—Lilly L. Age seven Admitted June 9 1913 Discharged July 16, 1913

Chief Complaint —Pain in lower abdomen

Present History —Yesterday vomited several times and had frequent watery stools. At 3 A. M. today had a sudden severe pain in the epigastrium It was colicky in nature and later became more localized to the right lower quadrant Vomited several times during the day and had a marked diarrhea (No mention made of chill in old history)

Past and Family History —No bearing on case.

Physical Examination —Well developed. Acutely ill.

taneously with the subsidence of the general infection. The time has not yet come, we think, when we dare wait on these acute cases, for we think it would be most unwise, with the present limitations of diagnosis to take the chance of letting a peritonitis from an appendix (or other condition) slip through our hands. Even if we could make a diagnosis from a blood-culture some forty-eight hours would have elapsed. Possibly more rapid methods of certain diagnosis may be developed in the future.

As stated above and for the reasons outlined, we differ from other writers who warn against operating in the diffuse form. The opponents of immediate operation have based their views on the great mortality said to attend early operation (Annand and Bowen give 86 per cent. mortality) but our personal experience has been favorable—16 per cent mortality

If an operation is performed in the acute stage a fairly thorough exploration should be made the appendix always seen, and it would be wise to take it out, as it may possibly be the source of trouble. The preponderance of opinion has been in favor of drainage. The opening in the abdominal wall can be closed for the most part. The only fatal case in our series was not drained. In this case the amount of fluid was quite small and the peritoneal irritation slight.

Specific therapy certainly in theory is desirable, and although the case for specific therapy is not quite settled, we think all will agree with us that it is desirable to isolate promptly the particular type of pneumococcus and administer the corresponding serum. The reports of types isolated have been largely of Groups I and II Group I predominating The question comes whether we should wait the necessary time for the differentiation or rather begin the administration of the most frequent, Group I or is it better to begin with the so-called polyvalent serum. The whole subject is very important, and it is hoped that publication of this paper may stimulate the study of the question. We are emphatically against resorting to the specific therapy as against operation, as we still believe that the best judgment calls for operation.

extended over the whole abdomen and was associated with tenderness, especially on the right side. No headache and no cough. Frequent greenish stools.

Past History—No bearing on case.

Physical Examination—Well developed and well nourished. Appears drowsy and acutely ill.

Head Face flushed. Nose normal alæ nasæ move with respiration. Mouth marked bilateral herpes labialis. Tongue very furred.

Neck Tenderness on both sides along line of carotids. Bilateral enlargement of submaxillary nodes.

Chest Expansion limited and rapid. Respirations 30 to 36

Lungs Normal percussion and breath sounds. Patient seems unable to draw a deep breath and breathes with upper part of lungs. Dr Conner found absolutely no lung condition to warrant diagnosis of pneumonia.

Heart Second pulmonic accentuated. Pulse about 100

Abdomen Walls rigid over the entire abdomen. Marked tenderness over entire abdomen. Does not appear to be localized.

Clinical Pathologic Findings—Urine Negative.

Blood count On day of admission, W B C 40 000 } 300
  Polys. 95 per cent. } counted.

Nine days after admission W B C. 31 000
  Polys., 88.5 per cent.

Seventeen days after admission, W B C., 24,000 } 200
  Polys., 86 per cent. } counted.

Twenty-two days after admission W B C., 11,200
  Polys., 81 per cent.

Operation (April 19 1915)—For acute appendicitis with diffuse peritonitis 3-inch oblique McBurney incision. Large amount of thin yellow pus found in abdominal cavity Appendix was swollen, red and covered with fibrinous exudate. Drain inserted. Discharged for two and a half weeks.

Laboratory Report of Appendix—Chronic catarrhal appendicitis with acute inflammation of peritoneal surface.

Bacteriologic Report—Organism isolated from material in abdominal cavity was undoubtedly the pneumococcus.

Head   Tongue badly coated. Mucous membrane of mouth dry

Thorax   Expansion good and equal.

Lungs   Resonance good. Breath sounds clear everywhere.

Heart   Sounds of good force. Regular. No murmurs.

Abdomen   Distended. Tympanitic. Tender everywhere. More marked in right lower quadrant. Some muscle spasm.

Operation—Appendectomy for acute appendicitis. Appendix slightly congested. A small amount of fluid of a serous nature free in abdominal cavity

Course—Operated upon on day of entry. Eight days later as condition was same—temperature high pain present in abdomen, and no signs of improvement—patient was transferred to medical side. Wound was clean. No redness or distinct tenderness along incision line. Entire abdomen distended and tender. Stools foul and loose. Was diagnosed here as pneumococcus peritonitis. Wound broke down and pus evacuated. Pelvic abscess formed. Was opened June 25th, and a culture showed it to be a pneumococcus peritonitis. It was not felt that the original condition was the same.

Clinical Pathologic Findings.—Laboratory report of appendix Acute catarrhal appendicitis.

Bacteriologic report Culture of pelvic abscess—pneumococcus.

Blood count On entry W B C 51,500. Polys 94 per cent.

Four days later W B C 15,000. Polys, 82 per cent.

Respiration High 30–36.

Pulse High 112–160.

Temperature Irregular—from 101 to 104° F Did not come down for over a month

Case II.—R. S. Age nine Admitted April 19 1915 Discharged May 25 1915

Chief Complaint—Three days go was suddenly taken sick with cramplike pains in epigastrium. A few hours later she vomited three times t intervals and had severe chill. The pain persisted for next two days and became more severe. It

Four days after admission W B C., 14 000 Polys 79 per cent.

Nineteen days after admission, W B C 16 600 Polys. 74.5 per cent

Operation (April 29 1915)—For acute appendicitis. Mc Burney incision. Considerable thin, light non-odorous fluid in peritoneal cavity Appendix was swollen, red and covered with fibrinous plaques. Removed. Culture taken. Drain inserted (Drain removed in eight days.)

Laboratory Report of Appendix—Acute catarrhal appendi citis with acute peritonitis.

Bacteriologic Report—Organism isolated showed to be pneu mococcus.

Blood Culture Report (April 29th)—Organism isolated from this culture when grown on human blood-agar shows colonies resembling the pneumococci. Inulin fermented in twenty four hours. Diagnosis Pneumococcus.

Four days after admission cough developed and lasted for six days. At this time rales in right lower lobe posteriorly Respiration high 30 to 45 per minute. Pulse rapid 110 to 150 per minute.

Temperature—First week 105° F after operation dropped to 102° F in twenty four hours 102° F to 104 F for week.

Second week irregular Normal to 102.5° F

Third week, irregular Big variations from normal to 105° F

Fourth week around 101 F

Case IV—M C Age forty-one. Married. Admitted October 17 1919 Discharged November 19 1919

Chief Complaint—Pain in upper abdomen

Present History—Started three days ago with sudden cramp-like pain in upper abdomen Next day whole abdomen felt sore and pain f jumping character returned that night, and has con tinued intermittently ever since. Pain and soreness much worse today than previously Yesterday took castor oil but bowels moved but little and today patient was given an enema. Has always been constipated. Nauseated and vomited past two days.

Five days after admission cough developed. Lasted a week. There were a few scattered rales at the time. Breathing slightly changed. Respiration rapid, 30 to 36. Pulse 140 at first. Gradually came down to about 100 in five weeks. Temperature

First week, 101.3° F operated, ranged from 100° to 103° F
Second week, 100° to 102° F
Third week, 103° F
Fourth week, around 99° to 101 F Touched normal once.
Fifth week, around 99° F

Case III.—M. F Age six. Admitted April 29 1915 Discharged June 10 1915

Chief Complaint.—Pain over lower abdomen.

Present History.—Yesterday was suddenly taken sick with cramplike pains in the abdomen (not localized) Ate a hearty meal, which was retained and patient felt better; but four or five hours later pain came on again. There was nausea, vomiting, and increase of colicky pain. *Could not eat and was kept awake all night by sharp stabbing cramplike pains. Headache persistant. Bowels constipated.*

Past History.—No bearing on case.

Physical Examination.—Well-developed child Is acutely ill.
Head Tongue much coated. Tonsils slightly enlarged. Alæ of nose did not move in respiration. Herpes around lips not marked.

Thorax Fremitus, percussion, voice and breath sounds normal throughout. *No rales. Four days after admission* there were a few crepitant rales in right lower lobe posteriorly No change in breath and voice sounds or on percussion.

Heart Rapid—130 Otherwise O. K.

Abdomen Rigidity over entire abdomen and generalized tenderness. The slightest pressure anywhere caused great discomfort. Especially marked on right lower side

Clinical Pathologic Findings—Urine 1019 alk., amb Tr alb., no glucose. Many hyaline and granular casts.

Blood On admission, W B C 38 000 Polys 96 per cent.

Second week varied between normal and 101 F

Third week varied between normal and 101 6° F

Fourth week varied between normal and 100° F

No pulmonary signs at any time.

Case V—Sarah G   Age five.   Admitted March 29 1920
Discharged July 7 1920

Chief Complaint—Pain in abdomen fever vomiting for past
week.

Present History—Began two weeks ago with cold, cough, and
running at nose. Fever has been intermittent. Some days temperature has been 104.2° F   Complains of pain across abdomen.
Bowels do not move without enemata.   Vomited last week.
Mother thinks temperature is higher at night than in the morning

Past History—No bearing on case.

Physical Examination—Young child lying quietly in bed
looks acutely ill, cheeks flushed, breathing slightly accelerated.
No cyanosis.

Lungs   Percussion note resonant throughout.   Breath sounds
vesicular   Few sticky râles anteriorly over large tubes on both
sides.   No areas of consolidation or bronchial breathing   Pulse
good quality although rapid.

Abdomen   Well nourished, of good conformation.   Rigidity
over entire abdomen.   Tenderness especially localized in area
below umbilicus.   Owing to rigidity no deep palpation was possible.   Dr Roper felt a mass to right of midline in pelvis by
rectal examination.

Clinical Findings—Urinalysis   Negative.   Blood counts
April 1 1920 W B C 7000   Polys. 55 per cent.

April 2 1920   W B C   12,000   Polys. 45 per cent.
Lymphos. 55 per cent. 200 cells counted.

April 3 1920   W B C   10,500   Polys. 66 per cent.
Lymphos. 34 per cent. 200 cells counted.

Wassermann negative

Operation (March 30 1920)—Coils of small intestine and
omentum were matted together in the pelvis.   Wound was enlarged downward and on attempting to separate the adherent
coils of intestines numerous abscess cavities were opened into.

Past History —Has not felt well since coming to America seven weeks ago Has had frequent headaches, but no definite stomach trouble.

Examination —Middle-aged obese woman, acutely ill. Every thing negative except abdomen, which was of boardlike rigidity and distended throughout. Marked tenderness in right upper quadrant just above umbilicus. Slight tenderness over remainder of abdomen. No masses.

Clinical Pathologic Finds gt.—Blood count October 17 1919 W B C., 35 900 Polys. 92 per cent. Lymphos., 8 per cent.

November 2d W B C., 21 600 Polys., 85 per cent. Trans, 3 per cent. Lymphos., 8 per cent. L. mino 4 per cent.

November 4th, W B C., 20,000. Polys., 78 per cent. Lymphos. 22 per cent.

Urinalysis (October 19 1919) Specific gravity 1024. Reaction alkaline. Color red brown. Microscopic oxalite R. B. C. Acetone and diacetic. No albumin or glucose.

Operation (October 17 1919) —Peritoneum contained a large amount of turbid serum and flakes of fibrin. Bowel enormously distended, especially cecum. Appendix subcecal, atrophic at its base, swollen, very dark, if not necrotic, at the tip with some fibrin on it. Exploration of rest of abdomen negative except for a large amount of purulent fluid in the pelvis and a very much enlarged uterus, about 6 x 4 inches, and very hard, but no apparent disease of the appendages. Rubber tube and cigarette drain to the pelvis. Partial closure. Note Diagnosis of appendicitis is probable, but not definitely established.

Laboratory Report of Appendix —Acute appendix. The peritoneal surface is the seat of an acute exudative inflammation.

Bacteriologic Report —Culture from peritonitis shows growth of pneumococcus Group II

Blood-culture sterile.

Temperature —On admission 103° F Pulse 120. Respiration 32. Eight o clock temperature day following operation 103.8° F   Then dropped until at end of first week temperature was between 100° to 101 F

the onset of the pain, vomitus consisting of food taken before.
Taking of water seemed to cause vomiting. On day before ad
mission continued to have vomiting. On admission patient has
localized pain. Greatest point of tenderness directly above and
below umbilicus. Temperature day before and day of admission.
No chills. Bowels have moved every day. Enema on day be
fore admission gave no relief.

Past History—No similar attacks previously. During week
before onset of present illness patient had cough. No expectora
tions and no pulmonary symptoms.

Physical Examination—Looks feverish but not acutely ill.
Very drowsy. Well nourished. Lungs. Negative for signs of
pneumonia. Abdomen. No distention. Some rigidity in lower
half. Pain on palpation localized around umbilicus. No masses
felt. No organs palpated. Herpes on lower lip.

Clinical Pathologic Findings—Urinalysis negative.

Blood count. October 31 1920. W B C 22,200. Polys.
95 per cent. Lymphos. 5 per cent.

Operation (October 31 1921)—Peritoneum seems a little in
jected and intestines slightly distended. On pushing up omentum
about ½ pint of turbid fluid evacuated. This fluid is rather less
milky in appearance than found in such cases. Is perfectly
odorless. No lesion. Appendix is somewhat irregular in char
acter and deemed best to remove it. No drainage.

Bacteriologic Report—Culture of pus from peritoneum shows
pure growth of pneumococcus Type I (mouse method).

Culture of blood in plain and dextrose broth shows pure
growth of pneumococcus, Type I

Temperature—On admission 104.8° F. Pulse 140. Respira
tion 40

Discharge Note—Cultures of blood and of pus from ab
dominal cavity showed pure growth of pneumococcus Group I
Lungs negative though history of recent cough was obtained
Continued to be semicomatose and died twenty four hours after
operation.

Received one dose of polyvalent serum.

The pus had no odor was thick and creamy in character with a slight greenish tinge, and contained large particles of fibrin. Culture was made from the pus and from one of the pieces of fibrin All the abscess cavities were between the coils of the small intestine and were chiefly confined to the lower half of the abdomen and especially to the pelvis. All these coils were separated and the abscesses thoroughly opened. The appendix was found lying over the pelvic brim, slightly swollen, but apparently involved from without.   Appendix removed.   Base ligated. Right fallopian tube was markedly swollen In its peripheral half, but no pus could be milked from t. The origin of the abscess could not be definitely determined. Rubber-dam Mikulicz tampon with two pieces of 4-inch iodoform gauze was then placed in the pelvis, completely blocking off the gut from the abscess cavity (Localized case)

Laboratory Report of Appendix —Subacute periappendicitis. *On the peritoneal surface there is a considerable quantity of granulation tissue, infiltrated with polynuclear cells. The wall of the appendix itself is uninvolved.*

Bacteriologic Report —Culture from appendix shows a pure growth of Diplococcus pneumoniae, Type I.

Blood-culture sterile.

Temperature —On   dmission 102.8° F   Respiration 40. Pulse 140

Discharge Note Culture of pus in peritoneal cavity reported Group I pneumococcus. Blood cultures taken on four successive days after operation reported sterile. Convalescence prolonged and stormy Fecal fistula developed on eighth postoperative day with considerable febrile reaction Temperature curve thereafter very irregular Discharged on one hundredth post operative day *with wound practically closed.* (*Ward In quarantine for last two weeks of child s convalescence)*

Case VI —Fannie G (sister of Sarah G Case V) Age four Admitted October 31 1920 Died November 1 1920

Chief Complaint —Pain in bdomen.

Present History —Two days before admissio had pain in abdomen, apparently general. Vomited two r three times after

OPERATION FOR THE REMOVAL OF COMPLETE CERVICAL RIB

OPERATION for the removal of a cervical rib often proves difficult and the result unsatisfactory Two cases of complete cervical rib are presented in the first there was incomplete
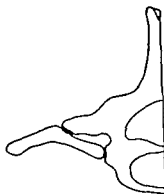
Fig. 127 —Rudimentary cervical rib. (From Ergebnisse.)

removal In the second the rib was adequately removed by a procedure to which I wish to call attention But before describing the operation certain features which are of practical importance will be reviewed.

Streisler has presented an exhaustive discussion of the subject. The illustrations reproduced from his article give sufficiently in detail the anatomic relationships of both complete and partial cervical ribs (Figs. 127–131).

Ergebnisse der Chirurgie und Orthopädie, Band v 1913 281 (bibliography).

the fact that a cervical rib or other anomaly was not suspected by the patient before the onset of symptoms preclude an exclusive psychic basis. Moreover the symptoms and objective signs usually cease after correction of the anomaly

Operation is advisable when symptoms develop which are sufficiently severe to incapacitate the patient or to cause persistent suffering or annoyance. To ensure a permanent cure

Fig 129 —Bilateral cervical ribs   (From Ergebnisse)

Streissler claims that the rib should be removed back to the vertebra and its periosteum should also be removed otherwise regrowth of bone may occur and cause recurrence of pressure symptoms.

Both anterior and posterior approaches have been recommended In our first case the anterior method was employed and the rib was, of necessity incompletely removed. Although

Many people are not inconvenienced in anyway by the
presence of such ribs. Others present quite definite symptoms
which are dependent upon pressure on the brachial plexus and
the axillary vessels, and consist in disturbances of sensation,
edema, and local temperature changes. The two cases here
presented illustrate quite typically the symptoms which call for
operative intervention. Palpation in the supraclavicular region
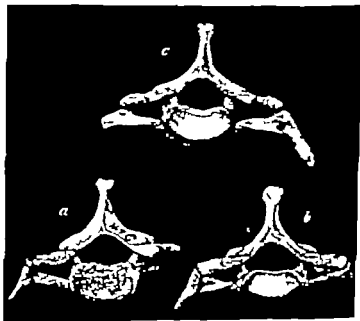
Fig. 128.—Rudimentary cervical ribs. (From Ergebnisse.)

reveals a bony swelling. The presence of the anomalous rib is
readily demonstrated by x-ray examination.

A peculiar feature is that the symptoms frequently begin
after some trivial accident, as a fall upon the outstretched hand.
Young women are often affected. The patients frequently are
the type which suggests hysteria. Yet real anatomic basis to
explain the subjective symptoms, striking objective signs and

hand. Six months before admission patient experienced pain and tingling in right hand. Right arm felt numb. The pain and tingling persisted. Patient said that in August, 1913 she fell on the palm of her right hand she did not remember any other injury. No member of her family had a similar complaint. The patient was a healthy looking girl. There was slight fulness in right supraclavicular fossa. This fulness was
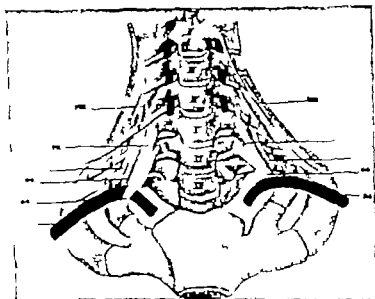
Fig. 131.—Complete bilateral cervical ribs, showing artery and plexus passing over the ib also attachments of M. scaleni. (From Corniet.)

evidently bone. The right hand was slightly colder than the left. Right radial pulse barely perceptible left easily felt. No difference in sensation or power on the two sides. Knee jerks present. x Ray showed bilateral cervical ribs (Figs. 132 133)

Operation, July 24th Collar incision 3 inches long 1 inch above right cia icle. Dissection exposed rib between brachial plexus which was drawn gently backward and artery which was drawn forward with retractors. The anterior portion from

a cure was affected, which may be regarded as permanent, since
six years have elapsed since the operation, we have felt that
insufficient rib is removed by this method to justify confidence
that a cure can be relied upon. In the second case a combina-
tion of anterior and posterior methods worked out admirably
The method appears to have features to commend it, especially
the fact that the rib is adequately removed   Apparently the

Fig. 130.—Incomplet bilateral cervical ribs. (From Engebause)

chief disadvantage is the possibility of injury t the spinal
accessory nerve, but the nerve should be voided if its situa-
tion is borne in mind and the incision through the trapezius is
made rather above and behind its course.

Case L—L. M. female, age nineteen operator single.
Admitted to the New York Hospital July 22d discharged
July 31 1914 Chief complaint was pain and tingling in right

the same Reflexes equal. Apparently a slight decrease in superficial sensibility over entire right hand and forearm.

Measurements *Right* arm 29 cm forearm 24.5 cm *Left* arm 30.5 cm. forearm, 25.5 cm.

Case II.—A S female, age seventeen single stenographer admitted to the New York Hospital April 19 1920 discharged

Fig 133—Case I. After operation.

May 1st. Chief complaints were weakness of left arm transitory swelling of left hand irregular pains and numbness in left arm

Two months before admission patient noticed that while reading she could not hold a book in her left hand as long as in her right. Soon she found that she could not use her left hand

beneath plexus to sternum was freed. It was then freed posterior to plexus and rib was cut across as far back as possible But this was only a short distance posterior to plexus. Its anterior attachment to first rib was divided and the detached portion of the rib including periosteum, was removed. On discharge wound healed. Pain had almost disappeared.
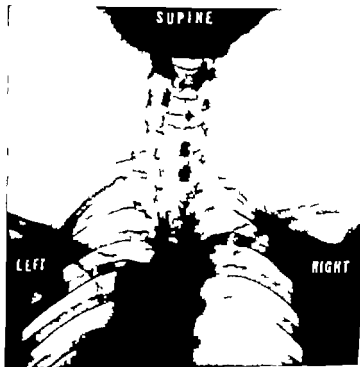
Fig. 152—Case I. Before operation

Late result. Patient has experienced nothing abnormal except that her right hand tires more readily than the left, yet she thinks the strength of the two hands is about equal. There has been no numbness or pain. On April 16, 1920 the right pulse is still much weaker than the left. Strength of two hands bout

the same. Reflexes equal. Apparently slight decrease in super
ficial sensibility over entire right hand and forearm

Measurements *Right* arm 29 cm. forearm 24.5 cm *Left*,
arm, 30.5 cm. forearm, 25.5 cm.

Case II.—A. S female, age seventeen single stenographer
admitted to the New York Hospital April 19 1920 discharged
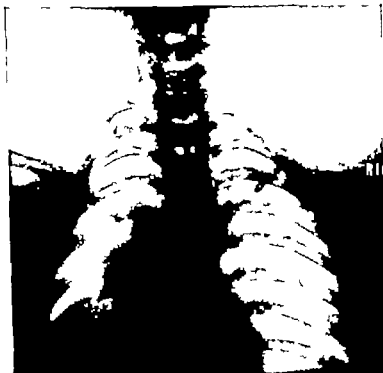
Fig 133 —Case I. After operation.

May 1st Chief complaints were weakness of left arm tran
sitory swelling of left hand irregular pains and numbness in left
arm.

Two months before admission patient noticed that while
reading she could not hold a book in her left hand as long as in
her right. Soon she found that she could not use her left hand
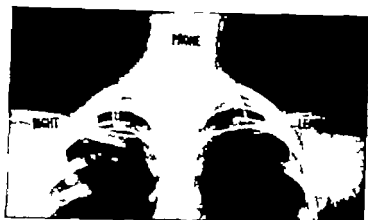
Fig. 134.—Case 11. *Before operation*

Fig. 135.—Case 11. *Postoperative*

for typewriting as efficiently as her right. She then noticed
that her left hand began to swell occasionally but only remained

swollen for a few hours. She sometimes noticed it in the after
noon, but by the next morning the swelling was gone. Her hand
became slightly blue when the swelling was present. About the
same time she began to have dull, irregular pains in the left
arm. Sometimes these began at the elbow and radiated to the
wrist, sometimes they were confined to the axilla, and once
pain was felt at the wrist only Nothing that she did relieved
the pain (Figs. 134 135)
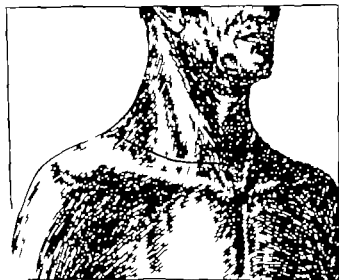
Fig 136 —Line of incision for removal of cervical rib.

At the same time that she noticed the pain and weakness
she noticed that her arm felt numb This persisted for only a
few days. Her left hand at intervals felt colder than the right.
Her general health was always excellent.

Previous personal and family history negative.

Physical examination on admission Well-nourished and
well-developed girl. Nothing abnormal was found other than
the surgical condition. There was a definite bony resistance in
both supracla icular fossae. On the left side there was marked

tenderness. Both arms equal in size and apparently in strength. The left arm everywhere sensitive to touch and perception of heat and cold. No visible trophic changes in the skin. No points of tenderness. x Ray showed bilateral cervical ribs.

Operation Collar incision beginning ½ inch above sternal end of left clavicle (Fig 136) Platysma and deep fascia cut, exter
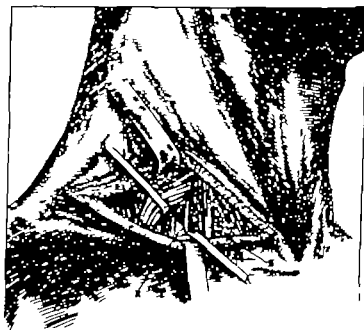
Fig 137 —Operation for removal of cervical rib R, Cervical rib A retractor drawing axillary artery forward B retractor drawing plexus up and backward S, scalenus anticus.

nal jugular being ligated and divided. Posterior edge of sterno-mastoid drawn mesially anterior edge of trapezius incised slightly and retracted for better exposure. Plexus easily defined by blunt dissection. The subclavian artery was readily recognized anterior to the plexus. The plexus was then gently retracted posteriorly and the artery anteriorly (Fig 137) exposing the rib which

was freed from muscular attachments without entering its perios-
teum the intercostal muscles below and the attachments of
scalenus anticus and medius being freed. The dissection was
carried backward beneath the plexus and forward to anterior
attachment of rib The rib was then freed posterior to the plexus
as far back as possible
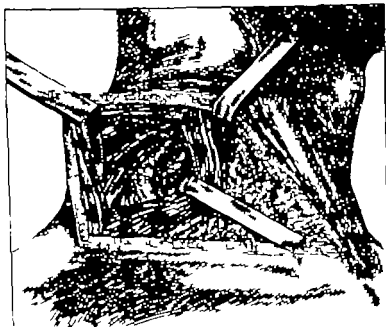
Fig 138.—Operation for removal of cervical rib Posterior part f
incision retracted upward R, Cervical rib to transverse process T re
tractor on cut surface of trapezius nd (L) levator anguli scapulæ

The parts were allowed to fall together anteriorly and the
skin and fascia were freed at the posterior part of the wound
and retracted well upward A vertical incision was made
through the muscles, namely trapezius and levator anguli
scapulæ so that the angle and adjacent parts of the rib were
freely exposed (Fig 138) With bone forceps the rib was cut
across without difficulty including the tip of transverse process

By a combination of anterior and posterior methods of approach through a single skin incision, as in Case II, a complete rib may be adequately removed and permanent cure ensured.

CLINIC OF DR. JOHN A. HARTWELL

Bellevue Hospital, Second Division Cornell University Medical College

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SUTURE OF MUSCULOSPIRAL NERVE FORTY-SIX DAYS AFTER ITS SECTION BY STAB WOUND

The first patient is a male, aged twenty-eight years, who was admitted to the service immediately after having received a stab wound in the left arm. Examination showed that a sharp instrument (presumably some type of knife) had entered the arm immediately above the extensor prominence, and had passed through the cubital fossa and emerged on the inner side just above the internal condyle. Some of the extensor muscles had been cut. An examination for injury of the musculospiral nerve failed to disclose this injury There was disability at the wrist and to the fingers, so far as their extensor action was concerned. This was interpreted as being due to the damage to the muscles themselves. The sensation in the distribution of this nerve is recorded as having been tested but it was not noted to be deficient.

The stab wound was treated in the usual way by thorough cleaning and suture. Primary union resulted. The patient left the service at his own request on the ninth day He returned to the follow-up clinic a month later at which time he showed the typical symptoms of section of the musculospiral nerve at the immediate site of the stab wound (Fig 140) The muscles on the extensor side of the forearm and the abductors of the thumb showed some atrophy There was a complete wrist-drop and a loss of power to extend the fingers. Sensory tests showed that there was a very limited loss of pain and tactile sense over the posterior portion of the thumb and of the web between it and the index finger

An interesting consideration in this case is the fact that the injury to the musculospiral nerve was originally overlooked. As stated, this was due to the misinterpretation of the muscular disability at the wrist, assuming that it was caused by the damage to the muscles themselves and, second, as shown this morning, to the very slight sensory disturbance which not infrequently results from the division of this nerve, since there is such an overlapping of the median and ulnar nerves. This im-

Fig. 140.—Showing complete wrist-drop due to severance of musculospiral nerve prior to operation.

presses upon us the necessity of making a rigid neurologic examination of such cases at the time of their injury.

The interval since the injury is now forty-six days. The procedure here will be to make an incision along the normal course of the nerve, as presumably we will find the divided ends with their bulbous formation in the scar tissue caused by the stab wound and the original repair but in the normal line of the nerve. I shall first look for the nerve above the point of section. The easiest place to find this is where it emerges from behind the humerus and passes into the muscles above the external

condyle. On separating the muscles the nerve is seen in this position. The dissection, now carried down, brings us to its entrance into the dense scar tissue, and on dissecting this out we now have the free bulbous end at the point of division. On dissecting through the scar tissue we come here in contact with the distal bulb and, dissecting it out, we find that it lies about an inch above the division of the nerve into its two main branches.

The problem now is to remove the bulbous ends of the nerve until we come to normal nerve tissue. This is best done by serial section, and the presence of normal tissue is determined by two observations: first, the fascicular appearance of the nerve, showing the different nerve elements of which it is composed lying in parallel bundles and the second is well termed 'blood sweating,' which means, as we see here, the oozing of the minute drops of blood from the cut end. The loss of nerve tissue in this case will be very small, so that there will be no difficulty in bringing the two ends into contact by simply flexing the elbow and extending the wrist.

It is now important to bring the two segments of the nerve into their normal rotation relation, that is, so far as possible, the fasciculi of the proximal end must be placed in contact with the corresponding fasciculi of the distal segment. You will have noted that I placed an identifying suture in the perineurium of each segment before dissecting it out. In suturing the nerve care will be taken that these identifications lie in their normal positions; in other words, that there has been no abnormal rotation of either segment.

The nerve is now repaired by the use of this very fine silk by interrupted sutures passing through only the neural sheath and so accurately placed that all the fasciculi shall be within this sheath, and therefore in their regeneration will grow immediately in contact with the distal segment. The suture line seems very satisfactory in this respect.

We will now dissect free all the scar tissue giving a good muscular bed for the nerve. Experience has shown that this is probably the least irritating of any tissue that can be used. As you will note, there is no tension in the line of suture with

the forearm and hand in their present positions. It is also seen that the forearm may be moved through an arc of 25 degrees before it throws any tension on the nerve. We will, therefore, close the wound and apply a molded splint to hold the limb in this position.

The subsequent treatment will be to leave the arm in this position for two weeks, at which time the splint will be removed and passive motion made through the 25 degrees that we have
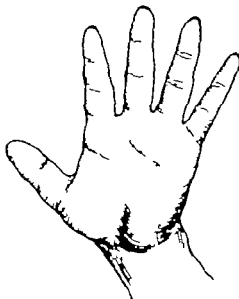
Fig. 141.—Present range of extension of wrist and fingers.

just demonstrated can be employed without throwing tension on the nerve. This will be continued for three weeks longer. Experiments have proved that at the end of five weeks the union of the nerve has the same tensile strength as the normal nerve. Accordingly at this time the splint will be removed and the patient instructed to gradually bring the elbow to full extension. The hand, however, will be retained in full dorsal flexion until the muscle power begins to return. Measurement shows that

the site of the section is from 90 to 125 mm. above the termina
tion of the nerve into the various muscles that it supplies. We
may therefore anticipate that a return of power will occur in
from ninety to one hundred and twenty-five days, since re
generation takes place at the rate of 1 mm. per day

Subsequent Note.—The plan as given above was followed out.
Primary union took place. The elbow gradually regained its
full arc of motion within two months. The hand splint was
retained for a little less than three months, and the first evidence
of a return of power actually occurred on the ninetieth day
according to the patient s own statement and our observation.
At the end of six months the limb was entirely normal (Fig
141) there being a complete return of muscular power and deli
cacy of movement to the forearm and hand but there still re-
mains a loss of sensation over the terminal distribution of the
nerve around the thumb This condition will last until regen-
eration has taken place throughout the entire length of the sen-
sory elements of the nerve.

CHRONIC OSTEOMYELITIS

THE second patient presents an entirely different problem from the ones previously discussed. He is suffering from a chronic osteomyelitis, and gives the following history

He is a man aged twenty-eight, who two years previous to coming under our observation, suffered from what is said to be an attack of "acute inflammatory rheumatism of the back Exactly what this may mean it is difficult to say but the important fact is that one week after this illness he received an injury in the right scapular region by being caught in one of the automatically moved heavy doors of a subway train, receiving a rather severe blow at about the middle of the scapular spine. He suffered no immediate serious effect from this but about six months later there appeared a swelling in the subdeltoid region which was painful and showed the evidence of a mild inflammation with suppuration. This was operated upon and the origin of the trouble was found to be a necrosis of the scapular spine about 1 inch from the acromion. The wound healed up rather slowly and he remained well until about two months before coming under our care. At this time there appeared a fluctuant swelling just above the clavicle and he showed some evidence of constitutional poisoning An incision was made in it and the resulting sinus has refused to heal and from time to time small pieces of necrotic bone have been discharged from it. Examination at the present time shows this discharging sinus, and a probe passed into it travels deeply under the muscles and strikes against bare bone on the ventral surface of the scapula.

The x ray shows what apparently is a fracture at the middle of the scapular spine, but may readily be osteomyelitis and immediately below the spine there is a clear round shadow which the radiologist has interpreted—without knowing the history

—as a bullet wound through the scapula with the history we interpret it as probably a focus of complete necrosis.

The problem in this case, as in all similar cases of chronic osteomyelitis, is purely a mechanical one. We may with absolute confidence promise this patient a cure provided we are able to remove all the dead and infected bone and leave the tissues in such condition that muscular or other soft structures will readily fall in place to fill up the resultant bony defect. In the case of the scapula, as here presented, this should not be a difficult undertaking   You will readily see, however that if we were dealing with a long hollow bone it might be anatomically a matter of great difficulty to find the necessary soft tissues which would readily fall into the defect. As you see, the probe strikes the scapula, as had previously been demonstrated, and at this point, about half-way to the scapula, is felt a small spicule of bone. With the curet I think we can dislodge this and bring it out through the sinus without enlarging it to any extent. It is now free and is here presented, and, as you see, is a piece of completely necrotic bone which has been working its way toward the mouth of the sinus and has traversed practically half the distance from the scapula to the front of the neck. Undoubtedly it is this small piece that has directly kept the sinus open but from the fact that we now feel bare bone and the fact that the x-ray shows disease of the scapula, a permanent cure cannot be expected unless we remove all disease

It will not be necessary to cut through the tissues transversely as we know that it is only the scapula that we desire to attack. We will therefore make the incision over the spine of the scapula at the site of its disease—*and here immediately below* the spine is found the button of dead bone which the x-ray showed, and which on the dorsal surface is directly opposite the point that the probe strikes on the ventral surface. It will therefore be necessary to remove the entire thickness of the bone. This can be done with a chisel, and valuable information will be obtained in this step. As you note, the bone separates rather easily at a definite margin, which indicates that this *is the line between the dead and living bone,* and contiguous to

it we find the granulation tissue in the sinus at its deep end. Examination of the spine itself and of the upper border of the scapula shows that this also is partially denuded of periosteum, and the medullary substance in this direction appears to be infected. This is sufficient evidence that the osteomyelitis is invading this portion to justify its removal, particularly as it will not cause material disability to do so. Removal also will be done with the chisel, and, as you will note, there is again a distinct line at which the bone in its diseased portion easily separates from the normal. With the rongeur we will now remove all jagged pieces and also accomplish the mechanical necessity of leaving a bony defect into which the muscles that have been lifted from the spine will easily fall to obliterate it as soon as it is free from infection.

It is this type of case in which the Carrel-Dakin technic can be used with the greatest ease. We will therefore place the Carrel tubes accurately in all parts of this wound in this way, cover them with the Dakin-soaked gauze, and immediately begin the instillation of the Dakin solution at intervals of one or two hours and this will be continued until the wound is surgically sterile.

The question now arises as to whether anything will be accomplished by suturing a portion of this wound in order to get early primary union. I am inclined to think that it will fail, as this man is rather susceptible to the staphylococcus infection, and it is quite likely that the stitch tracts will become infected. If we have been successful in removing all the dead and diseased bone and the infecting organism is, as we assume, a Staphylococcus aureus, we may hope to accomplish such sterilization in a period of two to three weeks, and, failing that, a cure may be anticipated in the length of time necessary for a wound of this size to heal, which will probably be another four weeks.

Subsequent Note.—The culture taken from the small fragment of the bone at the central portion of the lesion developed pure Staphylococcus aureus. The wound followed the anticipated course. There was a rather severe staphylococcus in-

fection of the suture tracks which necessitated the removal of
the sutures on the third day throwing the wound wide open.
This demonstrated that it would have been fully as well not to
have sutured the wound at all, as discussed at the time of the
operation. No evidence of uncovered bone could be determined
after the fourteenth day.

This case is a practically typical example of a patient who has
a low resistance to Staphylococcus aureus. His attack of "acute
inflammatory rheumatism of the back" was undoubtedly the
beginning of his infection in the scapula. It is possible that he
might have thrown this off had he not received the subsequent
injury but the two combined were more than he could over
come, and the classical subacute osteomyelitis resulted. The
case illustrates in every respect the principles involved in the
pathogenesis and treatment of this common affection. It is
curable in most instances if these principles are thoroughly
understood and our therapy is carried out along the proper line.

ACUTE EMPYEMA

Our third case is one of acute empyema, a subject of unusual interest at the present time. It differs, however from the usual postpneumonic empyema, in that there is also present a pneumothorax.

The patient is a man forty two years of age, who was admitted to the medical side on December 20 1920 with a typical lobar pneumonia of both lobes of the left lung. The sputum showed Type II pneumococcus. The patient ran a very severe course of pneumonia and did not properly defervesce. On the tenth day he developed signs of fluid in the left chest and on the eleventh day an aspirating needle showed the presence of thick pus and air in the left pleural cavity. He was transferred to the surgical service, and the x-ray and physical signs at that time showed that there was an almost complete obliteration of the left thoracic cavity by a pyopneumothorax. The heart was pushed far over to the right and the lung was compressed almost completely around its root. The patient's general appearance, his previous history and the development of a pneumothorax as well as a pyothorax, strongly indicated that the patient might be suffering from tuberculosis, as a pneumothorax following a definite pneumonia is uncommon.

Repeated examination of the sputum however failed to show tubercle bacilli. This negative finding did not convince us that tuberculosis could be excluded, and accordingly we were unwilling to convert the condition into an open draining chest cavity because where tuberculosis is present this inevitably leads to a chronic suppurating tuberculous empyema which it is almost impossible to cure. Therefore, after thoroughly studying him, it was decided to empty if possible the chest cavity by means of suction drainage. This was done fourteen days ago by the method which we regularly use in this clinic. It is simple and effective. Under local anesthesia, at the selected site (in this case the eighth interspace of the scapular line) an incision is carried down

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to the pleura, in which a small nick is made and through this is
passed a firm moderately large fenestrated tube into the pus-
containing thorax. The end of this tube is kept controlled with
a clamp. It is fastened at the proper depth with a suture placed
in the skin. The wound is very firmly packed with well-vaselined
gauze and a copious dressing is tightly strapped around it.
This simple device makes an air-tight joint which will remain
air-tight usually from one to two weeks. The open end of the
tube is then connected with a water bottle, one glass tube of
which passes under the surface of the water and the second acts
as a pressure equalizer. The pus will drain from the chest into
the water bottle, but on inspiration the water rises in the tube
and acts as a valve to prevent the entrance of air. In this par-
ticular patient this arrangement remained air-tight for about ten
days, during which time he drained a continuously decreasing
amount of pus—there being 21 ounces on the first day and 2
ounces on the ninth day. His temperature during this period
changed from its previous daily excursion of 98° to 102° F to a
maximum rise of 100° F. During the ten days he maintained a
good negative pressure, as determined by the rise of water in the
water valve tube. The physical signs and the x-rays show that
there has been an expansion of the lung and a change of the heart
position toward the normal, so that the remaining cavity in the
chest is now not more than an estimated one-fourth of its original
size.

The problem that presents itself today is whether we shall
consider the patient as on the road to complete recovery with-
out further operative procedure. We believe that experience
has amply demonstrated that such is not the case. One of the
most potent causes of chronic empyema is inadequate drainage.
This patient has been complicated by a frank pleural fistula, as
shown by the presence of his pneumothorax. We have no cer-
tainty that he is as yet completely healed although the expan-
sion of his lung is a strong indication that it has. However the
small drainage opening that he has from the first operation can-
not be considered adequate to get rid of the remaining pus, with
a complete expansion of the lung.

We will therefore proceed to resect a sufficient amount of rib to assure the constant emptying of this cavity. This is done by the classic procedure, except that we will remove the periosteum because it is found in many cases that a regeneration of bone may interfere with the drainage for a sufficiently long period and in any case it is a complicating factor in maintaining a wide opening. On palpating the chest cavity through the opening we find that the lung can now easily be reached, but there still remains a large anterolateral cavity extending from the diaphragm to the apex of the lung and lying to the left of the heart. We will place one large double drainage tube and await further x ray study on the progress of the case to determine subsequent treatment.

In general, however, it will be to keep this cavity thoroughly drained and to prescribe calesthenics and pulmonary gymnastics in order that expansion of the lung may take place as rapidly as the cavity becomes clean.

You will naturally be interested in the question of the use of Dakin's solution in this case. You will recall that the patient had originally a pneumothorax which, as stated means a bronchopleural fistula. Therefore it would be inadvisable to put Dakin's solution in this cavity except under precautions which will not flood the lung with the solution in case the fistula is still patent. Our procedure will be to permit drainage to take place for a period of five or six days, and then cautiously introduce a small amount of Dakin's solution. If the bronchial fistula is still patent it will be immediately indicated by the passing of the chlorin gas into the patient's larynx, with the resultant violent coughing. This finding will absolutely contraindicate the use of the Dakin solution. If however no such symptom arises, we may conclude that the fistula is closed of which we already have evidence by the expansion of the lung since the first operation, and we may then proceed to use the Dakin solution in the accepted way. In this clinic we are thoroughly convinced that the proper use of this solution carefully safeguarded is a very great aid toward producing sterility of the cavity and that when sterility is produced we may confidently expect (if no other

complications be present) that the lung will expand to entirely fill the chest cavity and that a complete cure will result. You will recall that I am now discussing *acute* empyema, and bear in mind that the problems presented by chronic empyema are quite different.

Subsequent Note —The procedure above indicated was followed out. The use of the Dakin solution indicated that the bronchopleural fistula had closed. The capacity of the cavity ten days following the second operation was still 300 c.c., but the bacterial count of the discharging pus dropped from infinity on the eleventh day to 4 on the thirteenth day and to 2 on the fifteenth day—the time that this note was made. The patient's general condition is excellent, and we have every reason to hope that his progress will continue as above outlined.

CANCER OF THE RECTUM

The patients to be operated upon this morning are all suffering from gastro-intestinal disease. The problems are quite different from the cases operated upon last week.

The first patient for operation this morning is a man seventy two years of age, suffering from cancer of the rectum. It is important to note that the history of this condition extends over a period of less than six months though undoubtedly the lesion has been growing for a much longer period. The first symptom he noted at that time was the development of a diarrhea with from three to eight stools a day in some of which he noted blood. With this condition he suffered from tenesmus, which was rather constant. He has lost 20 pounds in weight since the summer

It is important to emphasize that this history is rather typical of carcinoma of the rectum though in many cases the growth will advance much further than we believe it has done in this instance, with even less marked symptoms. The importance of this lies in the fact that approximately 50 per cent. of the patients presenting themselves for operation in this condition are so far advanced in the disease that radical operation is impossible.

The diagnosis in this case is easily confirmed by a digital examination of the rectum 4 inches above the anus there is felt an ulcerating mass with crater like characteristics, which bleeds easily upon examination, but does not obstruct the bowel. It will be noted that no x ray has been taken. The reason for this is that the diagnosis is certain without it, and in this clinic we have a strong feeling that the use of bismuth or other opaque substances in the intestinal tract, where there is marked interference with the proper propulsion of the fecal content along the intestinal canal, should be avoided. We have had experiences in which the bismuth mass has piled itself up behind a partial obstruction and thus has been a serious handicap at the time of operation.

The problems confronting us in cancer of the rectum at this site are two (1) Is the patient suffering from distal metastasis that makes cure impossible? (2) Is the local condition such that the growth cannot be removed without too great danger to life or of destruction of necessary organs, for example, the bladder and ureters?

It is our belief that these questions can be answered only by an inspection within the abdomen, and therefore in all cases *our first step is to open the abdominal cavity* It is the rule to find the earliest metastasis in the liver so that this organ is first examined. The local growth is then palpated and a decision reached as to its operability

We believe that any cancer of the rectum which can be reached by the examining finger cannot be cured except by a removal of the entire lower segment of the rectum, including the anal sphincter A study made by the operator some years ago and published in the Annals of Surgery showed that an attempt to remove these growths with preservation of the sphincter resulted in a very large percentage of local recurrences or severe stricture. You will please bear in mind that I am referring to cancers situated at or below the peritoneal reflection. Those situated higher about or above the rectosigmoid junction, present a different problem with a different solution.

We will now open the abdomen in its lower part by the incision that we have found most satisfactory namely through the middle of the left rectus sheath, from the umbilicus downward to the pubis. The rectus muscle is then drawn out from the midline, thus preserving intact its blood and nerve supply and the posterior sheath is opened a short distance from the midline. On repairing this abdominal incision all the structures may be placed in their normal relations, and it has been our experience that hernias do not occur Incidentally it may be remarked that this same incision is used in the upper abdomen for our gastric and gall-bladder surgery for the most part

Exploration.—We will now explore the liver which, you see, can easily be done by passing the entire hand through this incision. The liver is normal in size and consistency and is

reached easily in all its parts. Metastases, when present, show
themselves by small or larger nodules situated beneath the per
itoneum and are easily recognized. The total absence of this
condition is sufficient evidence that the liver is not involved
therefore we may proceed, with the hope that the patient is
amenable to cure. Examination of the tumor itself shows that
it involves the rectum at the peritoneal reflection. It is mod-
erately adherent at the base of the bladder and at one point
shows on the peritoneal surface of the bowel, where it is obvi-
ously ulcerating through, but has not, as yet, involved any
other tissue. We find that it is movable in the hollow of the
sacrum and we therefore conclude that there will be no diffi-
culty in removing it. No lymph-nodes can be palpated.

The problem that now confronts us is to completely remove
the growth and all the lymph-nodes draining it, even though
they are not palpable the three dangers that must be avoided
are first, undue shock from a too prolonged operative pro-
cedure second, loss of blood third later sepsis from contam
ination and improper drainage of the large traumatized operative
field. We therefore proceed in an orderly manner to avoid these
specific dangers.

We first determine that by dividing the bowel about 5 inches
above the growth we will be able to take out the segment of the
sigmoid and rectum below it with all the regional lymph-nodes
and will have an ample amount of sigmoid remaining to estab-
lish our left inguinal colostomy which will be the permanent
outlet for the fecal content. It is well known that any soiling
from the sigmoid content is very prone to produce severe infec
tion therefore we avoid opening the bowel until the last step in
the procedure. The mesosigmoid is divided on either side and
reflected back laterally after thoroughly protecting the rest of
the abdomen with the pads. The sigmoid is then raised ante
riorly the superior hemorrhoidal vessel ligated at the point de
termined for section, and all other smaller blood-vessels are
ligated at the same point. We have thus controlled completely
all serious bleeding much as is done after ligation of the uterine

arteries in a hysterectomy In fact, our procedure throughout is very analogous to this operation.

The lateral incisions in the peritoneum are now carried down to the Douglas pouch and anteriorly through this reflection, to expose the posterior surface of the bladder and the anterior surface of the rectum below the peritoneum. The dissection then proceeds on either side until the ureters are completely identified and exposed to their entrance into the bladder The sigmoid is then raised from its posterior bed and the dissection is carried well down into the coccygeal hollow behind the rectum. We now lift the bladder the seminal vesicles, and the prostate from their relation to the rectum. This, as you see, carries us well below the growth which is now completely mobilized, and we can follow the ureters into the bladder so that we are sure that we have avoided damaging them.

The entire cancerous area with its lymph-nodes is now free from the point chosen for section down to the pelvic outlet. Since we are to do this operation in one sitting it is important that the entire abdominal procedure be carried as far as this, otherwise our second step would prove unduly difficult.

We now proceed to make an ordinary intermuscular incision in the left flank for the purpose of establishing the colostomy Next, the peritoneal floor is completely repaired except for the point through which the rectum still passes, around which a purse-string suture is placed for later tying The bowel is now divided between two crushing clamps with the cautery—every care being taken to prevent soiling—and is burned close to the bite of the clamp Each end is closed with an inverted purse string suture, and the proximal end is passed out through the opening made for the colostomy and anchored at that point. The distal end is dropped into the pelvic cavity below the repaired peritoneum and the purse-string suture tied, thus completely closing off the peritoneum from the portion of the bowel to be removed. You will see that we have thus avoided two of the dangers, first, hemorrhage second, soiling from the bowel content, as the bowel was opened only at the very conclusion of the operation under every possible precaution.

The abdominal wound is now repaired in its normal relations and since the patient's condition is entirely satisfactory we will take pains to carefully suture it, using for the most part chromic gut, with silkworm-gut for the skin, which also reinforces the fascial suture. We have so far taken an hour and a half for the operation. Our patient is in good condition, and as the remaining procedure will not require more than fifteen minutes we may immediately proceed to it.

The patient will be placed in a very exaggerated lithotomy position, so exaggerated that the plane of the perineum is horizontal and very considerably elevated above the body. This makes our procedure very much easier and at the same time prevents loss of blood from venous oozing. A sound is passed into the bladder. An incision starts in the mid perineum passes backward, encircling the anus on either side (which has been closed with a purse-string suture so as to prevent soiling) and is carried backward beyond the coccyx. The incision is deepened anteriorly until we reach the urethra, laterally until the levator ani muscles are encountered and posteriorly into the coccygeal hollow. With blunt dissection you now see that it is an easy matter to pass upward until we come into the hollow of the sacrum where we find lying the bowel already loosened from above. My finger now exposes the prostate which, as has already been stated, was dissected free from the rectum in the abdominal section. I now grasp the free bowel from above and have the growth in my hand and by gentle traction it can be drawn entirely out through the perineal wound. There are only one or two lateral blood vessels passing near the levator ani muscles at this point which it is necessary to clamp and ligate. The final dividing of these attachments frees the entire rectum, and we have the large subperitoneal cavity widely open before us. This we will wash out thoroughly and then pack loosely with well vaselined gauze which will be sufficient to control the oozing and allow the escape of any septic material, and can easily be removed in forty-eight hours, after which the whole cavity will be irrigated daily.

The operation is finished under two hours and the patient's condition is very satisfactory
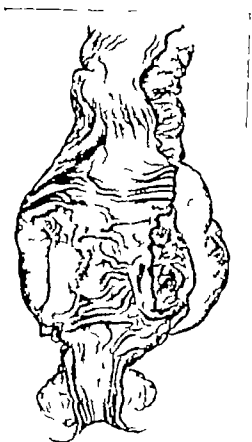
Fig 142.—Cancer of the rectum. Sectioned through the middle of the growth longitudinally Note the ulcerated portion of rectum in central portion of figure

In this instance I shall now open the colostomy and insert a large tube into the bowel to establish immediate drainage be-

cause it is noted that there is a very considerable amount of intestinal blocking due to the imperfect emptying of the feces previously

Examination of the specimen shows you the ulcerated crater with the muscularis and peritoneum involved as already stated (Fig 142)

It may be of interest to you to discuss the advisability of doing this operation in two sittings. The operator is strongly of the opinion that where possible it should be done in one sitting We have had a considerable number in this clinic and have always been able to conclude the operation within two hours, and in no case has the patient been in undue shock. When done at two sittings we feel that there is always the possibility of severe sepsis arising from the portion of the bowel that has been freed and placed in the subperitoneal sacral hollow In spite of every care, there will be sufficient contamination of this seriously traumatized area to allow a very serious infection, particularly as many of these cases come to operation only when the cancer has ulcerated a considerable distance through the bowel wall. Such a condition in a more or less debilitated patient is ideal for the development of a septic state in the interval between the first and second stages, and as before stated, one of the great dangers to these patients is sepsis. If done at one stage, as here illustrated the lower cavity is widely drained and this danger is avoided. In case, however for any reason it is deemed necessary to do the two-stage operation, I must caution you against carrying the dissection of the first stage as far downward as was done this morning This will inevitably result in too great a denuded area, so that without the lower drainage the probability of serious sepsis is too great to risk.

The microscopic examination showed the lesion to be an ulcerating malignant adenoma. No lymph-node involvement could be found.

Subsequent Note —The postoperative course of this patient was very satisfactory The anterior abdominal wall healed, except for the skin, per primam the colostomy functioned nicely and in ten days the posterior wound was a clean granulating

surface which will close within a month or six weeks. Since the growth was adequately removable and no lymph-nodes were involved the permanent prognosis is more than fair. Malignant adenomas are as a rule, not distantly metastatic and complete local removal gives hope of a permanent cure.

NON TUBERCULOUS INFLAMMATION OF THE CECUM

THE second patient for operation this morning is a boy aged fourteen whose history and examination suggest, but fail to positively determine, the diagnosis. The only symptom from which he has complained is that of mild recurrent attacks of abdominal pain during the previous year. In general this pain seems to center in the region of the appendix but has never been severe enough to confine him to bed until the present attack, which began four days ago. This has been rather more severe and has been accompanied by vomiting on one or two occasions, but there has been no irregularity of the bowel.

The patient is an Italian, as you see, of rather frail build and possibly what we recognize as a tuberculous type. His temperature has not been elevated above 99.5° F during his three days stay in the hospital. His leukocyte count is 17 000 with 66 per cent. polynuclears.

The physical examination reveals entirely normal conditions except that the abdomen shows some general rigidity very moderate however in amount, and tenderness on deep palpation in both lower quadrants but rather more marked on the right. A sensation of doughiness is noted as being present on palpating the abdomen. There is believed to be a mass in the region of the cecum but this has not been definitely made out. Because of the chronic course of the disease the doughy sensation the boy's nationality and general appearance, the diagnosis of tuberculosis of the cecum has been suggested rather than a simple appendicitis, and therefore I shall make an incision which will permit a more radical operation if this proves to be the case.

Palpation under ether reveals a rather definite mass which is movable and I believe strongly tends to confirm the diagnosis. We will make the same incision as was used on the first case, except that it will be done upon the right side. This gives us free access to the cecal region without undue retraction, and

permits us to lift it with the appendix into view. You note that the appendix is a rigid, erect organ, very much thickened, shows the evidence of a chronic inflammatory process, and near the base you may note a chronic perforation. There is, however, absence of suppuration in the surrounding tissue, and the cecum is very markedly involved in the process. The lymph-nodes in the mesentery of the ileocecal junction are enlarged and succulent.

We are now presented with a pathologic problem of difficulty. This condition may be due to tuberculosis or simply to pyogenic infection. Obviously the disease has involved the greater part of the cecum the wall of which is thickened I should say nearly ⅓ inch. It is very hard. There is absence of any evidence of tuberculosis in the rest of the peritoneum. We particularly note the absence of miliary tubercles on the peritoneal surface.

This lesion may occur as the result of ulceration in the cecal mucosa of non-tuberculous as well as of tuberculous character. The question therefore arises. Will this boy recover if we remove the obviously diseased appendix and trust that there is no ulceration within the cecum, but that the cecal involvement is pyogenic in origin and will resolve if the appendix be removed? It will not do so of course, if the tubercle bacillus is the exciting cause. All things considered, I am inclined to believe that the best procedure is a removal of the entire cecum, adjoining ileum and colon, and will therefore proceed to that operation.

For this purpose it has been amply demonstrated that it is wiser to remove all of the colon that has not a well-developed mesentery which means usually (and does in this case) up to the hepatic flexure. We may then do anastomosis between the ileum and the colon in a portion of the latter well provided with peritoneal covering which will aid materially in closing the sectioned end of the colon and making a lateral anastomosis. The incision, therefore will be carried upward sufficiently to expose the hepatic flexure, still preserving the abdominal wall, as mentioned in the previous case. The portion of the bowel to be removed is now mobilized by dividing the outer leaf of the mesentery and ascending mesocolon, which gives us ready access

to the blood-supply of the part of the bowel to be removed. These blood-vessels are now clamped the bowel is lifted forward and inward, the inner mesenteric leaf is divided and thus we lift the entire cecum, ascending colon, and about 4 inches of the ileum outside of the abdominal cavity

The peritoneum is now thoroughly protected and the bowel is divided 3 inches from the ileocecal valve and again at the hepatic flexure. You note that I am dividing the bowel in this case with the knife rather than with the cautery and that my protecting clamps are not tightly compressed. I believe that these steps are important because a cauterized bowel does not seem to me to heal as kindly and firmly as when sectioned with the knife. We will now close the open end of the bowel by an overwhipping stitch of chromic catgut and a further inversion under three layers of chromic gut inserted after the method of Lembert. It is of the utmost importance that great attention be paid to the closure of these blind ends of the bowel, since they are very prone to leakage. A side-to-side anastomosis is made by the usual method, as employed in gastro-enterostomy with the blind end of the ileum and the colon both pointing toward the right. The stoma, as you see, is about 1 inch in diameter and so far as can be determined we have accomplished a complete closure so that no leakage should take place. Of this, however my experience does not make me very confident, as I have seen a number of cases in which leakage did take place when the large bowel was involved even though every care was taken to avoid it.

We will now close the posterior peritoneum and place the omentum around the site of the anastomosis, thus leaving the intra-abdominal contents as nearly normal as our operative procedure will permit. The abdominal wall is closed by the same method as used in the other case without drainage except in its superficial part, trusting that if leakage does occur it will find its way along the omentum to the surface or will wall itself off in such a way that a future drain may be used. The reason for adopting this course is that any drain, to be efficient, must necessarily lie close to the anastomosis or the closed ends of the

gut. If by chance the drain comes in contact with the suture line, it undoubtedly tends to aid leakage, therefore we feel safer in not employing it.

The specimen, as you see, shows the condition already described (Fig 143) On opening the appendix it is seen to be tremendously thickened and is necrotic at its base, with the

Fig 143 —Lesion involving the appendix and the cecal all. Note the extensive fibrous back failed reveal evidence of tuberculosis All the coats are involved

chronic perforation already mentioned There is nothing that proves that this case is tuberculous, and there is no ulceration inside of the cecum, though, as you see the disease involves its wall over a very considerable area. We shall have to wait for the pathologic report to decide the question as to the etiologic factor

Subsequent Note.—Very careful examination of the cecum

and the appendix failed to give any proof of tuberculosis. The process was a chronic inflammatory one without the formation of tubercles or giant cells but even with this we believe it unsafe to say that the case is not tuberculous because—as amply shown in the literature—many of these cases later develop a tuberculous peritonitis or more extended section proves some spot in which the tubercle bacillus has been active. The German authorities are inclined to believe that there is a tuberculous element in all cecums of this type.

This patient did develop a fecal leakage, which, as we had hoped, readily found its way along the omentum to the abdominal wall and drained outward through the wound. It remained open for about eight weeks, with very moderate leakage, and spontaneously closed.

CHRONIC GASTRIC ULCER

Our third patient is a woman aged forty-seven who presented herself with the typical history of gastric ulcer which is confirmed by the x-ray findings as shown on this plate (Fig 144) The defect as seen by the fluoroscope is here demonstrated in

Fig 144 —Filling defect with permanent loclsure opposite t n. Note the high position of the ulcer on the lesser curv ture.

the middle portion of the lesser curvature and is of very considerable extent, reaching upward toward the cardia.

For the approach of this lesion we will use the same incision as in the two previous cases, except that I shall go through the left upper rectus because I anticipate greater difficulty near the cardia than at the right end of the stomach. The lesion here is

well demonstrated and, as you see, involves an area on the lesser curvature about 3 inches in extent, passing on to both the anterior and posterior walls. It reaches to the vertical portion of the cardiac end of the lesser curvature. Of course, cancer cannot be excluded, but the history (lasting over a long period) the patient s general condition, the localized nature of the lesion, all point to non-malignancy.

The problem before us is as to the best type of operation. There are three courses open to us we may either excise the ulcer and repair the defect, or we may do a so-called sleeve resection of the central portion of the stomach, including the ulcer or we may do a subtotal gastrectomy. The pros and cons of these procedures are fairly well established, but still admit of very considerable discussion. If a simple excision of the ulcer be done, there will be great difficulty in closing the most proximal portion of the lesser curvature as it is rather inaccessible. Moreover the repaired stomach will be greatly deformed, and there is a good deal of evidence that excision of this portion of the stomach with local repair results in a serious motor disability of the stomach. The ultimate result, therefore, may be a badly functioning organ which even a gastro-enterostomy will fail to totally obviate. Further there remains behind a portion of the stomach which may be the seat of subsequent ulceration, and, of course, if the lesion prove to be malignant we have failed to cure our patient. For these reasons this operation does not seem advisable here.

The sleeve resection is fraught with too much operative difficulty as it will be almost impossible to make a perfect end-to-end closure so far up on the lesser curvature. Therefore we shall proceed to do a subtotal gastrectomy. This will be the easiest of execution, and I believe involves less risk to the patient, and it will have the great advantage of removing both the ulcer and the ulcer-bearing portion of the stomach. The resulting condition has proved t give an exceedingly good function, and is probably less liable to gastric disturbance than the less radical procedures discussed.

This operation proceeds on well-established lines. The gas-

trohepatic and gastrocolic omenta are opened the blood-supply of the portion to be removed is clamped and as you now see, the stomach is mobilized The difficulty lies in the highly sit uated cardiac lesser curvature, and in order that this may remain well within our reach I shall anchor it with this simple stitch before placing my clamp and excising the stomach. Now by placing one clamp just distal to the pylorus and a second one on the portion of the stomach to be left, the intervening part of the stomach is excised We may now proceed to the re-estab-lishment of the gastro-intestinal tract, either by closing the duodenum and the open end of the stomach and then doing a gastro-jejunostomy or we may do the gastrojejunostomy after the Polya Reichel method using a portion of the open end of the stomach for the anastomosis or by the method recently advocated by Moynihan, in which the anastomosis is made be tween the whole open end of the stomach and the side of the distal segment of the jejunum which is sectioned about 8 inches from the pylorus and its proximal open end implanted laterally into the distal segment about 3 inches beyond the gastroje junostomy opening Moynihan thus avoids the possibility of a vicious circle and has the drainage of the bile and pancreas into the jejunum without passing above the anastomotic stoma. This he believes to be a distinct advantage but it is obviously a considerably greater operative procedure

In this instance the best procedure seems to be the first named and I am therefore closing the stomach with a lock chromic gut stitch for hemostasis, and reinforcing this with the usual overlying peritoneal stitch. The end of the duodenum is similarly closed The jejunum now rises close against the stom ach, as you see. but will pass more easily if it is drawn through the transverse mesocolon, as thus illustrated The mesocolon is now stitched firmly to the stomach wall and enough on the stom ach so that the anastomosis lies well below The anastomosis, as you see is done in the at present accepted method of an internal lockstitch of chromic gut reinforced with a peritoneal chromic gut stitch The resulting stoma lies slightly on the anterior wall of the stomach, which seems to give the most

satisfactory anastomosis, and is sufficiently large to admit two fingers.

Our closure of the stomach wall at that difficult point on the lesser curvature has been very satisfactory which seems to justify the adoption of the method followed. The abdominal wall is closed in the method already described, and no drain is used.

The specimen (on turning it wrong side out, as you see) reveals the ulcer corresponding exactly to the x-ray findings.

Fig 145.—Perforating gastric ulcer showing penetration and craterlike formation through all the coats. Note extensive thickening and the amount of stomach removed.

It has perforated through to the peritoneal attachment of the lesser curvature, and there is an extensive area of induration surrounding it. On section, however it lacks the characteristic appearance of malignancy and will probably fail to show cancer under the microscope.

Subsequent Note.—Microscopic examination later proved the lesion to be a simple ulcer with no evidence of malignancy The patient s convalescence was without incident of ny kind

and an x-ray examination at the end of three weeks shows the
stomach functioning well and the stoma draining from what now
is apparently the most distant and dependent portion of the

Fig. 146.—After subtotal gastrectomy. Note the extent to which the
stomach has dilated as food reservoir. Emptying is complete in the normal
time

stomach (Fig 146) This confirms the statement already made
that, as a rule, subtotal gastrectomy leaves a very satisfactorily
functioning organ.

CLINIC OF DR. ALLEN O WHIPPLE

PRESBYTERIAN HOSPITAL

SURGERY OF THE BILIARY TRACT

Cases for Postoperative Discussion I, II and III. Case for Operation IV

CASES FOR POSTOPERATIVE DISCUSSION

Case I.—J G male, fifty-eight. History No 49 139 Admitted November 22 1920

Chief Complaint.—Discharging abdominal sinus. Pain in right upper quadrant

Past History—He was operated upon twenty years ago for gall-stones. A large stone was removed. Gall-bladder was drained. No history of typhoid Lues denied. Neisser infection thirty years ago Following the operation he remained well and free from digestive disturbance for seventeen years.

Three years ago he began to have discomfort in the region of the scar and noted a gradually increasing swelling in the scar In May 1920 he was operated upon for repair of a ventral hernia. There was a moderate infection of subcutaneous tissue of the wound but it healed without impairing the hernia repair Three weeks after the wound had closed two sinuses developed One of these persisted and discharged intermittently mucous and at times calcareous material

For six weeks preceding his last admission to the Presbyterian Hospital he had been having attacks of cramplike pain in right upper quadrant, radiating to right scapula. These attacks were accompanied by no vomiting but belching of gas. Bowels were not clay colored No jaundice No loss of weight

Physical Examination—A well-nourished rather obese man

of middle age. He did not appear to be ill. Color good. No jaundice or sclera or skin.

Pupils   Unequal, right pin-point, and did not react to light.

Tongue   Moist, coated.

Teeth   In poor condition. Moderate pyorrhea.

Lungs   Normal.

Heart   Normal.

Abdomen   A scar was present, oblique, 19 cm. long parallel to the costal margin, 8 cm. from it, right extremity a fistulous opening was seen discharging a inspissated material. The discharge increased with pressure under the costal margin in mid clavicular line   Here there was a moderate tenderness on deep palpation.

Knee jerks   Active and equal.   No Romberg.   No ataxia.

Laboratory Findings.—Wassermann reaction negative in both antigens.   W B C not elevated.

Duodenal intubation unsuccessful because of hyperactive pharynx.

x Ray examination, with opaque cathertic to the fundus tract, showed the catheter passing upward and to the midline No shadows of calculi were seen. A probe, passed a distance o 10 cm. gave a gritty feel.

The points of interest and those to emphasize in this case are

1 A cholecystectomy with freedom from symptoms for seventeen years

2. Recurring symptoms of distress in right upper quadrant with development of hernia. At the time of the second operation—the one for hernia repair—the operating surgeon recorded in the history that there were numerous old adhesions between anterior parietal peritoneum and the gall-bladder / c a marked scar made cholecystitis. But every effort was made to avoid traumatizing the gall-bladder. The removal of it then was not considered, inasmuch as it was the purpose of the operation was hernia repair and primary union. Nevertheless, probably as a result of heart function in the several adhesions, some infection occurred. But this cleared up be followed later by the appearance of fistula in the scar.

self from lumbar puncture in fracture cases, and there are many
other unrecorded cases that I have heard of. The withdrawal
of cerebrospinal fluid from the spinal meninges in a case of
increased intracranial pressure permits the cerebellum to drop
down on to the medulla and become jammed into the foramen

Fig. 618 — Methods of doing   entricle puncture   One needle is inserted
through the temporal lobe to hit the descending horn of he lateral entricle,
or the needle is inserted onto the frontal region to hit he entricle in the
frontal lobe

magnum and brings on suddenly or in a few hours   respiratory
collapse

In conclusion, let me say   few words on the subject of
concussion, that time-honored term which has come to us through
the ages. What is it what are the symptoms and what is its
pathology?

My own feeling is that the less the term is used the better for it is very confusing In my own work the only case I am willing to call one of concussion is the individual who is hit or falls on his head and is momentarily unconscious, gets up feels groggy may have a slow pulse for an hour and then goes about his business. Every injury more severe than this I consider is a contusion and laceration of the brain. I do not believe that patients die of concussion alone, and consequently it is impossible to construct a pathology for it.

The intracranial manifestations of a fractured skull may therefore all be grouped under the headings

Compression.

Contusion and laceration.

Hemorrhage.

This patient whom I have shown you had first a contusion and laceration, and later developed symptoms of compression, for which she was operated Following operation she cleared up rapidly and was discharged about three weeks after her injury

CLINIC OF DR. HARVEY S. McKAY

St Louis University

CARCINOMA OF THE STOMACH: PARTIAL GASTRECTOMY

The first case for operation this morning is referred from the medical service of Doctor J C Lyter with a diagnosis of carcinoma of the stomach The patient is a female fifty three years of age and married. Her present trouble began in 1921 and started gradually with pain in the epigastrium occurring either before or after eating at first rather mild and recently more severe. Her pain has never been severe enough to require a hypodermic of morphin for relief. When the pain appears it lasts for a few minutes and disappears rather suddenly For the past six weeks the pain has been present most of the time every day previous to that time it came only periodically When she was free from pain there was no discomfort from eating or exercise Vomiting is present only when she has pain at times there is nausea independent of pain, but no vomiting Appetite is poor patient is afraid to eat. Bowels move regularly every day There are no pains over the lower portion of the abdomen The pain radiates into the left side into the left lumbar region, and at times into the intrascapular region. The pain in the intrascapular region is not influenced by rest or exercise this pain is described as a cutting sensation There has been a loss of 30 pounds in weight in the last six months sleep is disturbed by reason of the pain referred to above There are a great number of nervous symptoms such as feeling of heaviness in the limbs, dizzy spells and so forth

Physical examination shows some emphysema of the chest, with no other abnormal findings. The heart cannot be well percussed because of the emphysema of the lungs. Auscultation,

however reveals very loud second sound over the base extending well up into the large vessels. There are no further abnormal signs. The extremities are normal with the exception of some evidence of a former hypertrophic arthritis of the joints of the fingers.

Abdomen is flat flaccid no enlarged veins peristalsis is not visible. There are no palpable tumors or free fluid in the abdomen no hernia. Liver spleen, and kidneys are not palpable. There are no points of marked tenderness upon deep pressure. The gall-bladder and appendix regions are both free from tenderness there is, however some slight muscular rigidity noticed on the right side just below the costal margin in the midclavicular line.

Blood-pressure systolic 148, diastolic 90 pulse 80 per minute.

Blood Wassermann reaction negative. ℞ B C. 8400 R. B C. 4,330,000 hemoglobin. 70 per cent. polymorphonuclears 59 per cent. small lymphocytes, 21 per cent. large lymphocytes, 16 per cent. eosinophils, 1 per cent. transitionals, 3 per cent. no abnormal red or white blood-cells no malaria organisms.

Urine Specific gravity 1.008. Albumin, sugar negative. Microscopic Moderate triple phosphat crystals few epithelial cells occasional red blood-cell.

Gastric Analysis

Fasting Content.

Free H C L	0	0	1 1
Combined H C L.	9		2
	—		—
Total acidity	9		9

Test-meal

Free H C L	0	0	2 5
Combined H C L.	9		3 4
	—		
Total acidity	9		

No lactic acid no occult blood.

Fluoroscopic examination of the stomach, as reported by Doctor Lyter showed that the barium passed rapidly from mouth into stomach No abnormal findings about the esophagus Stomach lies very high the lower border being at the umbilicus. The walls are distinctly hypertonic. At first there

Fig 619 — Ray plate carcinoma of the stomach prior to operation.

is a pronounced filling defect on the greater curvature near the pylorus. Other than this the walls are clear with no filling defects. The duodenum is visualized well throughout, with a perfect cap The duodenum is apparently fixed in position.

The x-rays of the stomach, which are shown for your inspection reveal the walls of the stomach clear with the exception of

the apparent filling defect in the greater curvature near the pylorus.

Considering all of the evidence taken gastric analysis, fluoroscopy x ray and history of the patient, it seems probable that we have a carcinoma of the stomach with which to deal. This woman is in the cancer age, has lost weight, and the other findings, particularly x ray point to either ulcer or carcinoma.

Fig 620 — x-Ray plate of stomach following resection and anterior gastro-enterostomy

The incision is made to the right of the median line, high up in the abdomen, from just below the cruciform cartilage to a point somewhat below the umbilicus   The gall-bladder presents itself in the incision, its walls do not seem t be very much *thickened there are no stones within it the bile can be readily* expressed. There are omental adhesions to it these adhesions can be easily freed and there is no oozing after freeing same.

The duodenum is fixed by adhesions and there is a tumor near the pylorus, chiefly on the greater curvature of the stomach, larger than a lemon. This is a crater-like tumor firm and does not have the typical feel of a carcinoma. There are no enlarged glands along the greater curvature nor in the lesser curvature. The pancreas is soft and the tumor is movable. Adherent to this mass on the anterior wall of the stomach is the omentum it is plastered rather firmly to this point. It is possible that there may have been a perforation at some time and the omentum is adherent at this point as a result. I am not sure if this is a chronic indurated ulcer or carcinoma. At all events, this seems to us a very suitable case for resection there are no very great mechanical difficulties to prevent such a procedure. If the tumor be carcinoma which it probably is it gives our patient the only chance for permanent recovery

First, we will free the omentum from its attachment to the tumor mass. Before doing this however we will place a few gauze pads around this area to prevent stomach contents being spilled in case the wall of the stomach is opened when the omentum is freed. Fortunately this does not open the wall of the stomach and there is no danger of spilling any stomach contents. The lesser peritoneal cavity is now opened and the finger can be passed behind the stomach and duodenum We will first clamp the vessels along the lesser curvature of the stomach up to a point at which we will cut the stomach in two later The vessels along the greater curvature are now caught in clamps and the gastrocolic omentum is severed between these clamps to the point on the greater curvature where the stomach will be cut in two later These vessels are all ligated with catgut, and now we free the duodenum to a point where we will apply a clamp around it before cutting it in two. The duodenum is caught in a clamp about an inch from the pylorus, and a second and similar clamp is placed around the duodenum on the pyloric side. We now cut the duodenum in two with the cautery We will place a purse-string suture around the duodenum and tuck the stump in much as one does the appendix stump after appendectomy We are using Dulox No 1 catgut

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Fig. 620 — Ray plate of stomach following resection and anterior gastroenterostomy

The incision is made to the right of the median line high up in the abdomen, from just below the ensiform cartilage to a point somewhat below the umbilicus. The gall-bladder presents itself in the incision, its walls do not seem to be very much thickened, there are no stones within it, the bile can be readily expressed. There are omental adhesions to it, these adhesions can be easily freed and there is no oozing after freeing same.

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on a straight needle. A second suture of the same material passes a second row around the duodenum and to this is attached omentum so as to prevent leakage of the duodenal stump. We have wrapped as you see the pyloric end of the duodenum in a piece of gauze so as to prevent contaminating the peritoneal cavity. Two large Kocher stomach clamps are now placed across the stomach at about the junction of the middle and upper fourth of same. We then cut the stomach in two between these clamps with the cautery. The end of the stomach is closed with three rows of sutures, the first including and bringing the mucous membranes into apposition, and Dulox No. 1 cat gut is used. A second and third row of sutures are of the Lembert type and are both of Dulox catgut. We will now do a gastrojejunostomy. It is apparently somewhat difficult to bring into the incision enough of the posterior wall of the stomach to perform a posterior gastrojejunostomy because of the high position of the cardiac end of the stomach, therefore we will do an anterior gastrojejunostomy. A portion of the anterior wall of the stomach is grasped in the Moynihan clamp near the greater curvature, the jejunum is brought up and, without put ting any tension on it, a Moynihan clamp is applied to the jejunum opposite its mesentery. The opening in the jejunum is made as near its origin as feasible, without putting tension on it. We will do a three-row suture gastrojejunostomy using No. 0 extra hard Dulox catgut.

We now are ready to close the abdomen, and this is done in layers. The fascia and peritoneum are closed with chromic catgut, three or four silkworm-gut sutures are used through all layers down to the peritoneum for the purpose of taking the tension off the suture line and the skin is closed with clips.

Let us now have a look at the specimen which we have removed. This is unquestionably a carcinoma. It has the rather typical appearance of same. Whether this tumor be carcinoma or ulcer undoubtedly the best operative procedure for this case is a partial gastrectomy. The patient is a very good surgical risk and as you see has stood the operation very well.

When this patient is returned to bed she will receive no

fluids per month for twenty-four hours. She will get continuous proctoclysis by the Murphy drip method and she will be given 2000 c.c. of saline solution in 1 20 per cent. novocain subcutaneously in twenty four hours At the end of twenty four hours she will be allowed sips of water and the proctoclysis will be continued as long as comfortably retained. At the end of forty-eight hours she will be allowed an increasing amount of fluids at regular intervals.

Note—This patient left the hospital at the end of three weeks, having had no untoward symptoms during her convalescence

Pathologic Diagnosis.—Carcinoma of the stomach

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HOUR-GLASS CONTRACTION OF STOMACH DUE TO ULCER

THE next patient is also a female aged fifty years married who came to the hospital in the Medical Service of Doctor J. C. Lyter three weeks ago. She was referred to the Surgical Service by Doctor Lyter with a diagnosis of gastric ulcer with hour-glass contraction of the stomach. Her trouble began about two years ago with sharp cramping pain in the upper left quadrant of the abdomen at times this pain would radiate around to the small of the back. Pain was intermittent patient would go for several months without noticing any pain or serious digestive disturbance and suddenly pain would reappear with marked digestive disturbances. The duration of the attack which brought her to the hospital had existed five days.

The general history and examination of this patient reveal nothing of special interest. Her best weight was 115 pounds her present weight 80 pounds

Urine analysis at time of admission showed specific gravity 1021 albumen a trace a few hyaline and granular casts an occasional pus-cell.

Blood examination showed hemoglobn, 70 per cent. color index 0 7 plus red cells, 4,500,000 leukocytes, 9500 small leukocytes, 17 per cent. large leukocytes, 10 per cent. endothelial, 3 polynuclear neutrophils, 70 per cent. Wassermann negative. Stool showed red blood-cells.

The fluoroscopic examination of the stomach, made just after her admission into the hospital by Doctor Lyter showed about one-third of the barium meal remaining in the stomach, the rest being in the ilium and cecum. Upon being refilled the lower border of the stomach was shown to lie 2 inches below the crest of the ilium it also showed a typical hour glass stomach. There is a niche about the middle of the lesser curvature which has all the evidence of a perforation. The duodenum was well visualised, with perfect cap The upper part of the stomach could not be moved.

itonitis and no indication for immediate operation. She was given sodium bicarbonate and glucose 5 per cent. per rectum by the Murphy drip method. She was also given 2000 c.c. of normal salt solution in $\frac{1}{3}$ per cent. novocain subcutaneously by the drop method in each twenty-four hours for three days. She improved gradually and a re-examination of the stomach with fluoroscope three weeks following her admission, with subsequent x ray plates showed what we considered a perforation at the site of the ulcer to have disappeared. The niche referred to above had closed, but the hour-glass contraction of the stomach remained.

We shall make an incision to the right of the median line from the ensiform cartilage to a point just below the umbilicus as was done in the preceding case. The stomach immediately comes into view and is greatly dilated it presents a typical hour-glass appearance. The contraction seems to be about the middle of the stomach however the portion of the stomach above the constriction is a good deal larger than the pyloric end In fact, it is rather difficult to bring the upper pouch down sufficiently to have a good view of it. On the lesser curvature of the stomach, about the middle of same is located a hard, indurated mass this is tightly adherent to the pancreas This indurated area has a diameter of 3 to 4 inches. The pylorus is wide open and there is no obstruction at this point. There is no evidence of ulcer around the pylorus or in the duodenum. The opening between the cardiac and pyloric pouch of the stomach is sufficiently large to permit of contents passing freely from one pouch to the other We are now attempting to free the ulcer to some extent, from its attachment to the pancreas and the gastrohepatic omentum This is very difficult to do and so far we are not meeting with much success We had hoped to be able to free the ulcer site destroy the ulcer with the cautery as recommended by Balfour and enfold the ulcer However it seems that the indurated area is so large that it will be almost impossible to do this therefore we will perform a midgastric resection of the stomach. We will free the gastrocolic omentum from the greater curvature from the point on the pyloric side where we intend to cut the stomach in two up to

x Ray plates of the stomach made at the same time showed the duodenum throughout with a perfect cap. Each of the plates showed a marked hour-glass stomach, the contraction being at about the middle of the stomach. The x-ray plates showed the niche referred to above on the lesser curvature, and, as you will see from these plates, a perforation is very probable. The

Fig. 621 — x-Ray plate of hour-glass contraction of the stomach showing ulcer before operation.

opening between the upper and lower portions of the stomach, as shown by the plates, would seem to be rather small.

The patient at the time of entrance was acutely ill and her condition was such that she was not considered a very good surgical risk, consequently she was kept in bed and placed upon an ulcer diet. There was at the time no evidence of per

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wall to a point opposite the point where this suture is started. Then we begin at the same starting-point and continue around toward the greater curvature around on the anterior wall until we come to the point where the opposite suture stopped. These are now tied together. The first suture which was left at the lesser curvature is now continued around on the anterior wall

Fig. 622.—Same after operation

of the stomach and is a Lembert suture which brings into apposition the serosa. It is tied to to the end of the suture which started originally on the greater curvature. We place now a few additional interrupted sutures along the anterior wall to reinforce the previous suture line. The gastrocolic omentum is now brought up and fixed along the greater curvature and the gastrohepatic omentum along the lesser curvature. Gauze pads

the point on the cardiac side, where we expect to cut it in two.
The vessels are caught in clamps and ligated with catgut. We
shall ligate the vessels in the gastrohepatic omentum to either
side of the ulcer and expose the points on the greater curvature
just referred to The blood vessels are now ligated and we will
attempt to free the ulcer The indurated area of the stomach is
rather tightly adherent to the pancreas and we will have to
shave off the portion of the pancreas in order to free this ulcer
The ulcer area is now free and we can proceed with the resec
tion. Large Kocher clamps are placed on the cardiac end of the
stomach above the ulcer and we will cut the stomach in two
between these clamps with the cautery The cardiac and free
end of the stomach are covered with gauze pads to prevent con
tamination of the peritoneal cavity You see it is now easy to
turn the stomach outward and downward in order to place the
clamps on the pyloric end of the stomach These clamps are
placed just as were the ones on the cardiac portion of the stom
ach and, again, the stomach is cut in two with the cautery
We have removed at least one-half of the stomach, although it
will be seen that at least 3 inches of the pyloric end of the stom
ach are left. This will giv us plenty of room to do an anas-
tomosis between the two ends of the stomach and, probably
will not interfere greatly with digestion afterward. After care-
fully packing off the area around the ends of the stomach we
bring the two ends of the stomach closely together and do an
anastomosis just as we would an end-to-end intestinal anas-
tomosis The first suture begins t the greater curvature and
brings together the peritoneal surfaces. We use 00 extra hard
catgut on straight needle for this row The suture is stopped
when we reach the lesser curvature, and a second row is now
introduced similar to the one just completed This suture is
tied when we reach the lesser curvature and will not be con-
tinued around the anterior surface of the stomach The next
row is placed through all the layers of the stomach and brings
together the mucosa. This suture, as you see begin in the
middle portion of the posterior wall of the stomach continuing
upward to the lesser curvature, and around on the anterior

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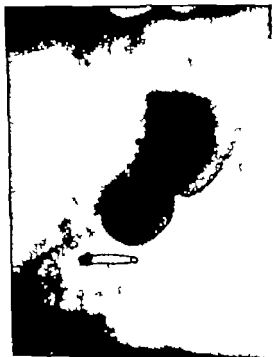
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are removed and we close the abdomen in layers, as was done in the previous case.

We have seen several cases of hour-glass stomach in our clinic in the last two years. It is practically always an acquired condition, the result, usually of ulcer and most frequently this ulcer is situated in the lesser curvature. Occasionally hour glass stomach is seen as the result of carcinoma, and it might be produced by some peragastric inflammatory condition, which would cause adhesions producing the contraction. It is probable that hour-glass stomach from simple ulcer is a more common condition than ordinarily supposed. Apparently it is found more often in females than in males. The diagnosis is one of the important triumphs of radiography By this means only can an exact diagnosis of bilocular stomach be made before operation. It is necessary to have a careful fluoroscopic examination together with plates before the diagnosis can be positively made. Hour-glass contractions of the stomach are seen frequently during fluoroscopic examinations as the result of spasms either in the presence of ulcer or induced by food intake or some other cause. Repeated fluoroscopic examinations and plates however nearly always determine positively the presence of permanent hour-glass contraction.

The type of operation performed in the case of hour-glass stomach must depend largely upon the nature of the contraction. Several operations have been advised such as posterior gastro-enterostomy gastrogastrostomy double gastro-enterostomy and sleeve resection. In the present case it seems to us that a midgastric resection or sleeve resection would promise the best means out of our difficulty

This patient will be given glucose, sodium bicarbonate proctoclysis, and saline hyperdermoclysis In twenty four hours we will start sips of water frequently and soon after the amount of fluids will be increased until soft foods can be taken

Note.—This patient made an uneventful recovery and a few weeks after her operation was eating freely of most all foods. thought she stated that she could not take a very large quantity at a time therefore, ate frequently She had gained twenty-five pounds in weight.

PLASTIC OPERATIONS ON NOSE AND FOREARM

THE last case which I wish to present is a female, who entered the hospital some eighteen months ago at the age of fifteen for the correction of two bony deformities one a congenital deformity of the nose and the other an acquired deformity of the left forearm and wrist. She is 1 of 3 children, the other 2 being perfectly healthy in every respect. Her parents are both living and in good health. Family history negative throughout.

When the patient first entered the hospital she was greatly undernourished thin and very much embarrassed about her appearance. The photographs, which I will pass around, give a very good idea of her appearance upon entrance into the hospital. She looked more like a girl twelve years of age than fifteen. She objected to going to school and did not seek the association of other girls of her age because of her appearance.

An examination at the time showed that she had a marked depression of the nose at about the bridge of same. The columella was absent, as was the lower portion of the septum. The nasal bones appeared as though they had been mashed in against the maxilla by a blow. The nares were almost completely blocked it was impossible for her to breathe with the mouth closed. The tonsils were greatly hypertrophied and filled with crypts which, apparently discharged pus. Her left forearm hung at the side fixed at the wrist and twisted toward the radius. The left forearm was very much underdeveloped by reason of lack of use though the hand was about the size of its mate. The flexor muscles of the forearm were noticeably better developed than the extensors. The radius could be felt roughened nodular and bent almost at a right angle ventrally. The ulna protruded 2 inches beyond the curved radius. There was very little motion in the joint the hand was of little use to the patient in this position, as it was impossible to straighten the wrist out or hit anything with it. The function of the fingers however was not greatly interfered with

are removed and we close the abdomen in layers, as was done in the previous case.

We have seen several cases of hour-glass stomach in our clinic in the last two years. It is practically always an acquired condition, the result, usually of ulcer and most frequently this ulcer is situated in the lesser curvature. Occasionally hour glass stomach is seen as the result of carcinoma, and it might be produced by some perigastric inflammatory condition, which would cause adhesions producing the contraction. It is probable that hour-glass stomach from simple ulcer is a more common condition than ordinarily supposed. Apparently it is found more often in females than in males. The diagnosis is one of the important triumphs of radiography. By this means only can an exact diagnosis of bilocular stomach be made before operation. It is necessary to have a careful fluoroscopic examination with plates before the diagnosis can be positively made. Hour-glass contractions of the stomach are seen frequently during fluoroscopic examinations as the result of spasms either in the presence of ulcer or induced by food intake or some other cause. Repeated fluoroscopic examinations and plates, however nearly always determine positively the presence of permanent hour-glass contraction.

The type of operation performed in the case of hour-glass stomach must depend largely upon the nature of the contraction. Several operations have been advised such as posterior gastro-enterostomy gastrogastrostomy double gastro-enterostomy and sleeve resection. In the present case it seems to us that a midgastric resection or sleeve resection would promise the best means out of our difficulty.

This patient will be given glucose sodium bicarbonate proctoclysis, and saline hyperdermoclysis. In twenty four hours we will start sips of water frequently and soon after the amount of fluids will be increased until soft foods can be taken

Note.—This patient made an uneventful recovery and few weeks after her operation, was eating freely of most all foods, thought she stated that she could not take a very large quantity at a time, therefore, ate frequently She had gained twenty five pounds in weight.

PLASTIC OPERATIONS ON NOSE AND FOREARM

THE last case which I wish to present is a female, who entered the hospital some eighteen months ago at the age of fifteen for the correction of two bony deformities, one a congenital deformity of the nose and the other an acquired deformity of the left forearm and wrist. She is 1 of 3 children, the other 2 being perfectly normal in every respect. Her parents are both living and in good health Family history negative throughout.

When the patient first entered the hospital she was greatly undernourished, thin and very much embarrassed over her appearance. The photographs, which I will pass around give a very good idea of her appearance upon entrance into the hospital. She looked more like a girl twelve years of age than fifteen She objected to going to school and did not seek the association of other girls of her age because of her appearance.

An examination at the time showed that she had a marked depression of the nose at about the bridge of same. The colu mella was absent, as was the lower portion of the septum The nasal bones appeared as though they had been mashed in against the maxilla by a blow The nares were almost completely blocked it was impossible for her to breathe with the mouth closed. The tonsils were greatly hypertrophied and filled with crypts which apparently discharged pus. Her left forearm hung at the side fixed at the wrist and twisted toward the radius. The left forearm was very much underdeveloped by reason of lack of use though the hand was about the size of its mate. The flexor muscles of the forearm were noticeably better devel oped than the extensors. The radius could be felt roughened nodular and bent almost at a right angle ventrally The ulna protruded 2 inches beyond the curved radius There was very little motion in the joint the hand was of little use to the pa tient in this position, as it was impossible to straighten the wrist out or lift anything with it. The function of the fingers, however was not greatly interfered with.

Undoubtedly the nasal deformity was of congenital origin, but the deformity of the forearm and wrist was acquired. The history of this deformity is rather interesting. When about two years of age, according to her parents, she had a number of furuncles on the left arm about the wrist. These were incised by her physician at the time though the infection at the wrist did not clear up for many weeks. In fact, the sinus persisted for

Fig. 623 —This photograph shows patient on entrance into hospital. Note deformity of nose and left forearm and wrist.

more than year following the beginning of the infection, and this bony deformity which is shown in the photographs followed.

Before we start the operation on this patient let me briefly tell you what we have done to her to date. The first operation consisted of removing her tonsils and adenoids. Three weeks later the first operation was done on her nose, and this consisted of breaking loose the nasal bones from the maxilla on either side

and elevating the nasal bones with forceps thrust up into either nares so as to obtain space for the purpose of breathing and to correct the flattened appearance of the nose. Small incisions were made on either side of the nose near the junction of the nasal bones with the maxilla, and with a chisel the nasal bone was broken loose from the maxillary bone on either side. Into each nares was pushed one jaw of a heavy septum forceps so that the

Fig. 624 —Another view of deformed radius.

nasal bones could be pried up from the maxillary bone. This could be readily done after the nasal bones were completely broken loose from the face. The nasal bones were held up in position and the nares kept open by the use of two metal splints, one in either nares, and attached to a specially constructed upper dental plate. These nasal splints were kept in place for several weeks and when they were removed, ample breathing space was afforded (Figs. 625 626) Following this the girl was permitted

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to go home for a period of three months. When she re-entered the hospital the improvement in her general appearance was most striking: she had gained weight rapidly was sleeping well, and breathed with the mouth closed all the time (Fig. 627)

Fig. 625 — Showing nose deformity from different position

The next step in the number of operations necessary t correct the various deformities was the correction of the left forearm. The x-ray plates together with photographs, show very clearly the deformity of the radius referred t before together with the elongated end of the ulna pushed forward o er the carpus

and extending down well under the tissue on the posterior aspect of the hand (Fig 628)   We desired, of course to keep out of the wrist joint if possible since there was present some motion in the joint, we preferred to do the work outside the joint, and this seemed not only possible, but the wisest thing to do   Conse-

F g 626.—Showing deformity of nose.

quently the radius and ulna were exposed through an incision on the extensor surface of the forearm bringing the deformed end of the radius well into view   We then removed a wedge shaped piece of bone from the radius with the apex of the wedge on the ventral side of the bone   The apex of the wedge did not

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somewhat interfered with and pronation and rotation slightly She states that she is attempting to play the piano and uses the hand for practically every purpose

Evidently this deformity was due to the infection which interfered with the growth of the bone Most likely the epiphysis

Fig 628 —Showing deformity of forearm; note end of radius curved toward flexor surface and elongated end of ulna.

on the ventral side of the radius at the distal end was interfered with and caused a destruction of the cartilage cells. Bidder showed by experience that injury to one side of the cartilage will stop the growth on that side, but may allow the bone to develop on the opposite side, thus producing a deformity such as was present in this case. Brooks showed in his study of

include the ventral side of the bone thus making it possible to
hold the radius in position without the use of any internal
splints. Then approximately 2 inches of the end of the ulna,
corresponding to the extra length of same, was removed. After
this was done it was possible to put the hand back in normal
position without difficulty. It was not necessary to place any
splints upon the radius, for the reason that a small shell of bone
was left on the under surface which held it nicely in place. After

Fig. 627.—Showing appearance of nose after breaking and elevating nasal
bones and before constructing columella

the wound was closed the forearm and hand were put up in
splints with the hand in hyperextension. The bone healed
rapidly and at the end of three or four weeks both passive
and active motion was instituted in the wrist joint, and in
five weeks all splints were removed. The x ray plate and
photograph show the position of the hand and wrist follow
ing this procedure (Figs. 629-632) At the present time she
has pretty nearly normal use of the hand though extension is

somewhat interfered with and pronation and rotation slightly She states that she is attempting to play the piano and uses the hand for practically every purpose.

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Fig 428 —Showing deformity of forearm note end of radius curved toward flexor surface and elongated end of ulna.

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bone growth that the development in the ulna is from an epiphyseal line at the distal end, while the radius develops from each end of the bone. Another factor in the production of this deformity may have been the pull of the flexor muscles probably the ulna was not involved in the disease and it grew to almost its normal length and pushed its way above the carpal

Fig. 629 —x-Ray plate made after operation. Shoa straightened radius and end of ulna cut off.

bones as the deformed radius pulled the wrist and hand toward the flexor surface of the forearm.

The operation which we are undertaking now is for the purpose of providing a columella to the nose. This we will do by taking a section from the median line of the upper lip. We will make an incision through the upper lip on either side of

the midline so as to obtain a section of the entire thickness of the lip about ⅛ inch in width. We will place a long-jawed forceps on either side of the lip and produce gentle pressure on

Fig 630.—Showing ppearance of arm and hand following operation on radius and ulna

Fig. 631.—Showing amount of flexion present in rist following operation

the lip to prevent bleeding when the incisions are being made. The incision is brought well up to the point where the columella begins from the upper lip We now trim the mucous membrane

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leaves the reddened mucous membrane on the outside, but, in our
experience, this soon assumes the same appearance as the skin,
and the reddened appearance of the mucous membrane is lost
after two or three months. We now will sew the incisions in the
lip from which the section was taken in the midline together
We are very careful to approximate the vermilion border accu-

Fig. 634 —Same as Fig 627 lateral view

rately This is a very simple method of reconstruction of the
columella, as you see and no deformity whatever is left in the
upper lip as the structures are very elastic and the lip assumes
the normal appearance in a very short time (Figs. 633 634)

You will observe in this case that there is still some slight
deformity of the nose. The bridge does not yet stand out as
well as it should there is a slight depression In a couple of
weeks I believe it would be well to take a piece of cartilage
from the rib and place t in this depressed bridge so as to fill out
this depression, and probably we shall do this at a later date.

from the point of the nose where we wish to attach the flap from the upper lip and suture this flap in place with two or three

Fig. 632.—Showing amount of extension following operation

Fig. 633 Showing appearance of nose and lip after raising nasal bones and constructing columella.

dermal sutures. We will place a few dermal sutures along the edges of the flap so as to bring the mucous membrane and skin into position. You see this throws the skin up into the nares

and leaves the outer portion of the columella covered with mucous membrane. Some surgeons have objected to this method of construction of the columella for the reason that it leaves the reddened mucous membrane on the outside but, in our experience, this soon assumes the same appearance as the skin, and the reddened appearance of the mucous membrane is lost after two or three months. We now will sew the incisions in the lip from which the section was taken in the midline together We are very careful to approximate the vermilion border accu-

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It is now a matter of eighteen months since she first entered the hospital and the photographs will show you something of the progress that has been made in correcting her deformities to date. In this time she has gained weight, has grown rather rapidly and is anxious to enter school and take part in the various activities in which girls of her age indulge.

CLINIC OF DR. W T COUGHLIN

St John's Hospital

UNUNITED FRACTURE OF THE MANDIBLE

This patient is a farmer thirty five years of age who nine teen months ago was struck on the point of the chin by a hand-spike, fracturing the mandible on both sides in the region of the bicuspids. He has been under the care of surgeons and dentists ever since. He complains that he is still unable to chew that he is unable to close his mouth that his chin has practically disappeared that his back lower teeth on both sides, but especially on the right side press against his tongue and make it sore. He has chewed no food since the day of his accident, nor has he done any work since that time.

Previous History—Up to the time of the accident he has always been healthy except for a *nervous breakdown from overwork* four years ago. He has been fourteen years married and has 4 healthy children, and there have been no miscarriages. He has never had any disease but that referred to his family history shows nothing remarkable and his Wasser mann both blood and cerebrospinal fluid is negative

Present Condition.—The patient is somewhat emaciated his normal weight is 175 pounds his present weight is 135 pounds he is 5 feet, 7 inches tall his complexion is pale his expression of eye is intelligent, the lower half of face presents a rather peculiar expression—the mouth hangs loosely open and the lower incisors, instead of projecting upward, point forward and lie in contact with the lower lip a little above its upper edge There is some drooling of saliva. On either side where face gives place to neck behind and below the angle of the mouth, there is a dimpled scar and on the right side at the bottom of the dimple are dried crusts that on the right is wider than that on the left.

It is now a matter of eighteen months since she first entered the hospital, and the photographs will show you something of the progress that has been made in correcting her deformities to date. In this time she has gained weight, has grown rather rapidly and is anxious to enter school and take part in the various activities in which girls of her age indulge

and a little pus oozes out. We conclude that suppuration has probably existed around the fractured ends and the right side still suppurates.

Comment.—Now gentlemen here is a patient that has been an invalid in a very pitiable condition for over nineteen months, and suffering from an accident which resulted in a bilateral fracture of the mandible. He sought surgical service immediately and after nineteen months treatment, during which time he has taken ether four times and been subjected to surgical operations he is still an invalid in a pitiable condition. Most of this might have been prevented had this patient been treated according to the same principles as he would have been had he sustained a fracture of his femur or any of his long bones.

All fractures of the lower jaw which involve the tooth-bearing portion are, except in the edentulous, to be regarded as compound fractures whether they appear to be such or not. It has long been well known that the first principle in the treatment of a compound fracture is early reduction as complete as possible, which means replacement of broken fragments in as nearly normal position as possible, and retention in that position while healing is going on, and that, furthermore ample provision must be made for drainage.

What would you think of a doctor who allowed a patient to go about with an unsplinted compound fracture of his tibia or who allowed a patient to lie in bed with an unreduced and unsplinted compound fracture of his thigh? It simply isn't done, as they say in England. What would you think of a surgeon who would wire the ends of a broken femur together and then fail to apply some kind of outside splint? Again, of course it isn't done. Then why is it that there are still surgeons who *are willing to tie or plate* two broken ends of a broken jaw together or tie together two teeth on opposite sides of a fracture line and then fail to immobilize the *whole lower jaw?* What can be easier than the immobilization of the lower jaw when provided with normal teeth and when *there is an upper jaw* similarly provided with teeth?

The patient himself provides the splint—if he brings a

One notes the almost complete absence of chin this is most marked as we raise the patient's head. On raising the head so that the posterior half of the face seems to pass directly on to neck no angle of jaw being apparent. His speech is much interfered with sounds as though he were holding some foreign body in his mouth while speaking, and we notice in speaking that his lips do not touch each other. We ask him to close his mouth. The lips can be closed with effort, but the teeth do not change their position nor does the chin come up. On asking him to open the mouth, one notices a movement especially marked toward the angles of the jaw the chin drops a little more, but on closing it it comes to rest where it previously was—one might say apparently at the level of the hyoid bone—it almost reaches his Adam s apple. On looking into the mouth most striking is the almost horizontal position of the lower incisor and canine teeth, and the lower molars lie close alongside his tongue. Notice the molars—only 2 on each side are present no bicuspids are visible. An interval of 2 cm. separates the canine from the nearest molar on the left side, perhaps 2½ cm. on the right side. The molars on the right side have their grinding surfaces turned almost toward the tongue and occupy a position within the plane of the corresponding upper teeth. This displacement inward of the molars is caused by displacement inward of the corresponding portions of the jaws. On the left side it is equal to the width of the teeth, and on the right side a little more than this. One takes hold of the incisor teeth and finds that he can lift and lower them and the chin without causing any movement of the parts of the jaw containing the molars, and on grasping the jaw in the molar region and again moving the portion of the jaw which carries the incisors we find two points of unnatural mobility one on either side, in the region between the canine and the first molar We know therefore that there is a solution of continuity of the bone on either side.

W examine again the scars previously referred to. In the main, on either side they correspond exactly with the point of unnatural mobility—there are firmly fixed t the bone in this region. We brush way the crust from that on the right side

unnecessarily Therefore, we go well away from the line of
fracture in seeking teeth around which to place our wire. We
usually select two on either side of the fracture line and wire
those to corresponding teeth in the upper jaw and then we seek
four sound teeth on the other side and wire these also   This
one can do whether he be dentist or surgeon   I have never yet
seen any harm come because of wiring the teeth. A lot has
been said about the loss of teeth because of wiring the jaws
together

Fig. 615.—Shows how wires are passed from within outward. Begin ith the
tooth farthest from you.

I believe if it is done in the following manner no trouble
will arise For this operation general anesthesia must never
be used, because should the patient vomit afterward he may
drown in his own vomitus before relief can come. We can
resort to nerve-blocking or use local anesthesia even 10 per
cent. cocain painted along the gums at the roots of the teeth
will be a great aid and I have done it very many times without
any anesthesia whatever

normal upper jaw with him. Fasten the lower jaw to the upper jaw and we can be assured that it is well splinted. Immobilization of the fragments is absolutely necessary. The manner in which this is brought about does not matter provided immobilization is obtained.

The compound fracture does not always suppurate, neither does the fracture of the jaw even though it be compound. However it very frequently suppurates. The infection comes from the mouth most often. These fractures often occur in people whose mouths are very filthy and in whom pyorrhea has existed for years, but even though it be as clean as it is humanly possible to make it the mouth is still surgically very unclean, hence we must rather expect infection in fractures of the jaw.

Now our methods of immobilization are many. It is well, if possible, to have the services of a dental colleague, one who is accustomed to making splints preferred, but whether he be accustomed to making splints or not, he is not a trained surgeon. He should be subject to the orders of the surgeon in charge because here arise problems that call for surgical training and skill, and nothing must be done which violates the fundamental principles of surgery. Splints and appliances of various kinds are desirable, but they are a luxury. If the patient has teeth like this one has they can easily be done without. Most of the dental colleagues and nearly all the medical know nothing of their manufacture or application.

We can immobilize the jaw by fastening the teeth in the lower jaw firmly to the teeth in the upper jaw. Let us see how this is done. We must suppose that the teeth that are near the line of fracture are involved in the fracture until such is proved to be not the case. In order to determine it satisfactorily an x-ray must be taken. It is not everyone who has an x-ray machine who knows how to take a radiograph of the lower jaw but when it is well done it is possible to determine whether the teeth are involved in the line of fracture or not. If a tooth encroach upon the line of fracture it is weakened, and no additional strain should be put upon it, otherwise it may be lost

unnecessarily Therefore we go well away from the line of fracture in seeking teeth around which to place our wire. We usually select two on either side of the fracture line and wire those to corresponding teeth in the upper jaw and then we seek four sound teeth on the other side and wire these also This one can do whether he be dentist or surgeon. I have never yet seen any harm come because of wiring the teeth. A lot has been said about the loss of teeth because of wiring the jaws together
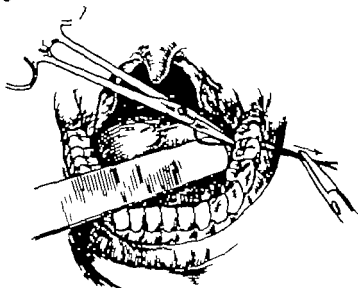
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The instruments needed are a couple of pair of artery forceps, scissors to cut the wire, pliers if you like to twist the wire, but heavy artery forceps will do. The wire used should be tough it should be non-corrosive such as silver or aluminum-bronze, but I have often used ordinary florist's wire which is iron, and the gage is never coarser than 26 or 28.

In wiring, first deal with the teeth in the upper jaws, and always deal first with those farthest from you. Pass the wire from within outward, and as the ends are being drawn taut an

Fig. 656.—The tip of an artery forceps is held firmly against the border of the crown bile wire is drawn into place around neck of tooth.

assistant with the tip of a closed artery forceps held against the lingual aspect of the tooth just where crown meets neck guides the loop to where it must be below the crown. The ends are then twisted and left long When all have been wired, the teeth are placed in normal occlusion, and the wires on the upper set are fastened to those below.

After-treatment.—The patient is given a mouth-wash and gargle. We oblige him to use it every hour by day and every two hours by night as long as there is danger of sepsis. After three or four days have passed he is obliged to use it only fre-

quently enough to keep his breath sweet. There is always more
or less swelling and one must be on the lookout for infection.
I do not advocate the immediate opening up and drainage of
fractures of the jaw which involve the tooth-bearing area, but
I do advocate the opening from below at the first sign of infec-
tion. The first sign of infection is a tender painful spot. Never

Fig. 637.—The teeth apparently in the fracture line are not used. One
selects if possible two teeth on either side of the fracture, and these are wired
to the corresponding two in the upper jaw. The figure illustrates how the
wires on the upper teeth are fastened to those on the lower. It is always well
to wire at least two on the opposite side of the mouth, as this prevents undue
strain on any tooth.

wait for fluctuation, but whenever a tender painful spot appears
at the site of fracture take the knife and open from below up-
ward never from without inward, cutting straight to the bone.
Make an incision not more than 1 inch long pass the blade of
knife close to the bone from below upward both on its outer
aspect and its inner or if you are afraid to use the knife use a
blunt dissector but stick close to the bone thus you open the

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line of fracture and drainage is assured. The wound in the
bone thus treated will clean itself very quickly there will never
be necrosis of bone and osteomyelitis will never occur and lead
to loss of substance and non-union, for that is what has happened
to the patient just presented. He has had infection of the site
of fracture, osteomyehtis, necrosis of bone and many opera
tions, has lost 6 of his teeth and that part of his jaw which bore
them and the sad part of it is that he has been under treatment
for nineteen months and is worse off than he was at first.

Our problem is to restore the bony continuity of this mandi-
ble in such a manner as to permit the jaw to function normally

Referring to the radiograms, we observe that a distinct
interval separates the broken ends on either side and that the
proximal fragments are displaced medially and that the distal
fragment comprises the arch of the chin, and that it is displaced
downward and rotated on an axis passing transversely through
the roots of the canines—the cutting edges of the incisors point
forward almost horizontally This is due partly to gravity but
chiefly to the downward and backward pull of the platysma,
digastrics, geniohyoid, and mylohyoid muscles. We will first
of all be obliged to draw the fragments into their normal rela-
tion with those of the upper jaw. The teeth of the upper jaw
are still in good condition, so that we do not hesitate to use
them for our fixed point of support

Now we must call to our aid the dental colleague and I am
fortunate in being able to a ail myself of the services of a very
excellent one. He has constructed a set of splints—one for the
upper jaw—all in one piece, made by casting an impression
taken in the usual way—a bar stands out from its edge about
2⅜ mm. and is firmly soldered to it to this bar will later be
fastened our pieces of elastic by means of which w will bring
about reduction, and till later the wires, to maintain retention.
The dentist has cleaned all the teeth and the gums are all
in fine condition for over a week. This splint he will now cement
firmly in place on the upper teeth. I have known such a splint
to remain firm in position for fourteen months.

He has also made three other such molded and cast splints,

one for the teeth in each fragment of the lower jaw On the outer and inner aspects of each of these he has firmly soldered a number of hooks all turned downward   To these hooks will later be attached the elastics and wires above referred to He will not cement these splints to the teeth which they are intended to fit on until the scar tissue is removed.

We must now excise all of the tissue from between and around the broken ends. We infiltrate the area of the scar with procain $\frac{1}{2}$ per cent. to each ounce of which has been added 4 drops of 1 1000 adrenalin solution, taking care (1) not to inject too rapidly (2) not to inject the tissues too tightly (3) to be certain that the periosteum itself on both sides of the bone is injected, and (4) that the tissues on all sides of the scar are infiltrated. The excision is elliptic, so that the edges will close in a straight line and almost all comes away in one piece There remains a portion of scar on the deep aspect of the broken ends, and it, too is all cut out. The bone ends now lie quite bare you will notice how white and smooth they are—eburnated— they look like polished ivory This is because they have been long inflamed—a panosteitis has occurred here and dead bone has been separated from the living The living bone remains but it bears about the same relation to normal bone that scar tissue does to normal tissue We will not cut any of it away but we will drill a few small holes in the fragment ends. We now make a thorough hemostasis, using the finest of plain catgut ligatures and tying only the largest spurters the others are controlled by torsion the minimum of foreign body is left in. The wound is now closed with figure-of-8 silkworm-gut and only one to each 1.5 cm is used.

The right side must now be dealt with. Here we find a sinus, and in order that I may be able to follow it to its farthest limits I inject under pressure a 2 per cent. aqueous solution of brilliant green.   We formerly used methylene-blue but the laundry complained of the permanence of the dye in the towels and sheets. We now infiltrate with the procain adrenalin as before and again we excise the scar And now here on the outer aspect of the distal fragment we find our green dye in

lme of fracture and drainage is assured. The wound in the
bone thus treated will clean itself very quickly there will never
be necrosis of bone and osteomyelitis will never occur and lead
to loss of substance and non-union, for that is what has happened
to the patient just presented. He has had infection of the site
of fracture osteomyelitis, necrosis of bone, and many opera-
tions, has lost 6 of his teeth and that part of his jaw which bare
them, and the sad part of it is that he has been under treatment
for nineteen months and is worse off than he was at first.

Our problem is to restore the bony continuity of this mandi-
ble in such a manner as to permit the jaw to function normally

Referring to the radiograms, we observe that a distinct
interval separates the broken ends on either side and that the
proximal fragments are displaced medially and that the distal
fragment comprises the arch of the chin, and that it is displaced
downward and rotated on an axis passing transversely through
the roots of the canines—the cutting edges of the incisors point
forward almost horizontally This is due partly to gravity but
chiefly to the downward and backward pull of the platysma,
digastrics, geniohyoid, and mylohyoid muscles. We will first
of all be obliged t draw the fragments into their normal rela
tion with those of the upper jaw The teeth of the upper jaw
are still in good condition, so that w do not hesitat to use
them for our fixed point of support.

Now we must call to our aid the dental colleague and I am
fortunate in being able t vail myself of the services of a very
excellent one. He has constructed a set of splints—one for the
upper jaw—all in one piece made by casting an impression
taken in the usual way—a bar tands out from its edge about
2$\frac{7}{10}$ mm. and is firmly soldered to it to this bar will later be
fastened our pieces of elastic, by means of which w will bring
about reduction, and still later the wires to maintain retention.

The dentist has cleaned all the teeth and the gums are all
in fine condition for over a week. This splint he will now cement
firmly in place on the upper teeth. I ha e known such a splint
to remain firm in position for fourteen months

He has also made three other such molded and cast splints,

that these wounds have suppurated a long time and that the scar is dense and tough, not vascular. Also it has been observed that scar tissue has harbored pus organisms for months. I know that the bone ends under such circumstances are hard and vascular and, in addition the scar acts as a hindrance to reduction. Above all, I am going to graft bone here and I wish to have the bone ends and the surrounding soft tissues as soft and as vascular as it is possible to have them without actually having them inflamed. As healing progresses massage and baking will be instituted, and in two or three weeks, if all goes well, the fragments will be in their normal position and the bone-graft will be done.

BONE-GRAFT OF THE JAW

It is now six weeks since this patient was operated upon for the removal of the scar tissue between the bone ends, and the wounds of that operation are firmly healed. The wound on the left side healed by first intention, but that on the right side, you remember opened into the oral cavity and in its depths was a focus of suppuration that had to be drained it therefore took four weeks to close. The dental colleague applied elastic traction the day after the operation and within two weeks the displaced fragments had been drawn into their normal positions, and now the wires take the place of the elastics and the splints on the lower teeth are firmly fixed by the wires to the splint on the upper teeth and thus the fragments are held with the teeth in normal occlusion.

We must now insert our grafts so that eventually the continuity of the bone will be restored.

There are three good methods of doing this. First, the method of Albee in which a slot 10 to 15 mm. wide and 3 to 6 cm. long is sawn in each fragment, its long axis parallel with the long axis of the bone with a special saw and then from the tibia a piece of bone is cut comprising the whole thickness of the cortex and just wide enough to exactly fit into the slots cut in the fragments. It must be as long as the distance to be bridged plus the lengths of the slots. It is lifted from its bed and placed

granulation tissue and with the curet we easily scrape away the dyed granulations and presently we find the tip of the canine tooth itself quite eroded. The tooth must be removed. We are careful to first be sure that there is no further extension of the sinus, and we search well, removing all of the scar tissue as before. We are quite satisfied the sinus leads to the root of the tooth and nowhere else. The root in question is only half in the bone, as you can see most of the bone on its proximal aspect has been lost. In this instance I make no drill holes in the fragment ends, even though they be if anything more white and hard than those on the other side. The reason is that here we have a sinus and pyogenic organisms and, furthermore, we are going to open the oral cavity. In such circumstances to drill or chip these bony ends is to court osteitis, and he has already had nearly two years of it. We make good hemostasis as before, and only partly close the wound, leaving a Dakin tube as far as the socket of the canine. The tooth is easily extracted there are no splinters and no projecting edges, so that the soft parts can easily obliterate the space and healing soon follow

The dental colleague will now apply the splints on their respective lower teeth first on the molars of each side he cements them firmly W now see the wisdom of delaying their application until the scar tissue has been excised This splint for the middle fragment has caps for both the canines and the incisors and you see that we found it necessary just now to remove the right canine what trouble one learns to avoid as one gains experience! The dentist very quickly amputates that part of his splint intended to cover the missing canine, and almost as quickly he cements the splint firmly to the remaining teeth in the upper fragment. He does not apply the elastics until the cement has well set. He assures me it will be firm in a few minutes, but I persuade him to wait for at least twenty-four hours. The patient's mouth is washed well with Dakin solution every two hours by day and night.

Comment.—I am sure some of you are wondering just why I excised the scar Well there are several reasons. I know

use of a straight piece of sufficient length. The second reason given, however, is the real one.

(Answering a question) No the defect is not too long for the osteoperiosteal graft. I have bridged a gap 6 cm. long with it.

Now first, we will operate only one side because as I have repeatedly said, the anterior fragment is very short and should I uncover it too much from its surrounding soft parts, as I must if I expose the fractured ends sufficiently on both sides, I shall seriously jeopardize its vitality and "primum non nocere must be our motto

Therefore today I am going to do the bone-graft according to the method of Delagenere on the left side and in three or four weeks if all goes well I shall perform a similar operation on the right side In the meantime to the right side which you remember contained a suppurating focus, we daily apply dry heat and massage in order to further insure the success of our future operation Now the patient has been given two hours ago hypodermically $\frac{1}{4}$ grain of morphin sulphate and $\frac{1}{150}$ grain of atropin sulphate and one hour ago he received in the same way $\frac{1}{8}$ grain of morphin sulphate and $\frac{1}{150}$ grain of atropin sulphate At our first operation he was somewhat nervous it being his first experience with local anesthesia Today he elects local, and comes without the slightest apprehension (In answer to question) No I shall never use scopolamin again I have used it a great deal, but I have learned to avoid it forever Nothing can ever persuade me to use even the smallest fraction of a grain in conjunction with morphin—the infiltration is carried on as before We are not going to reopen the scar however although I must infiltrate the tissues overlying the bone ends I do the same with those lying below the level of the jaw opposite this site I am very careful not to thrust the needle into the mouth cavity should I accidentally open the mouth cavity I shall discontinue the operation and try again later I now incise below the lower border of the jaw parallel with it and about 2 to 3 cm away from it. The cut is at least 7 r 8 cm long and its anterior end goes almost to the median line The flap is turned upward. It comprises the skin

in the slots and fastened in with absorbable suture material.
It not only affords a scaffolding for new bone to bridge the gap
upon but also acts as a stay or internal fixation apparatus while
this is being done. It is excellent when the slots in the frag-
ments can be placed so as to lie in the same straight line. (In
this case you will remember our anterior fragment is short and
both its ends pointed. It is obvious we must not bare it too much
nor will it bear much slotting)

Second, there is the method much used in England by Cole,
in which a piece of bone is cut from the lower border of one of
the fragments long enough to more than bridge the gap the
soft parts, except the skin, are left attached to the lower border
and it is then slid forward or backward, as the case may be,
and its ends fastened to the corresponding fragments so as to
make a good bone contact and bridge the defect. It is easily
done, and it is thought that the attached soft parts insure its
vitality and make success more certain. It is of decided advan-
tage for short defects and where the oral cavity is opened or
where the wound suppurates from any other cause. If you
doubt your skill, t is the one to use for small defects.

The third method is that given to the French by Delage-
niere of Le Mans. I have used t more than any ther because
I like it better It consists in taking thin shaving of the
cortical layer of bone with its overlying periosteum, cut the
desired length and width After freshening the fragmented
ends and turning back the periosteum on their inner and outer
aspects for a distance of 1 to 3 cm this bit of shaving is placed
on the inner aspect of the fragments. A similar piece is laid
on the outer aspect of the fragments again making good contact
of bone to bone and then a shorter bit of shaving either with or
without its periosteum is placed in the interval between the
other two and just nicely touching each of the bone ends.

This third method is the one I have decided to use in this
case because First t is more easily done. Second the anterior
fragment is short and its ends are pointed and when ttempting
to repair I do not care to run the risk of destroying more and
third the contour of the jaw here does not lend itself to the

use of a straight piece of sufficient length. The second reason given, however is the real one.

(Answering a question) No the defect is not too long for the osteoperiosteal graft. I have bridged a gap 6 cm. long with it.

Now first we will operate only one side because, as I have repeatedly said the anterior fragment is very short and should I uncover it too much from its surrounding soft parts as I must if I expose the fractured ends sufficiently on both sides I shall seriously jeopardize its vitality and "primum non nocere must be our motto.

Therefore today I am going to do the bone-graft according to the method of Delagenière on the left side and in three or four weeks if all goes well I shall perform a similar operation on the right side In the meantime to the right side which you remember contained a suppurating focus we daily apply dry heat and massage in order to further insure the success of our future operation. Now the patient has given two hours ago hypodermically $\frac{1}{4}$ grain of morphin sulphate and $\frac{1}{150}$ grain of atropin sulphate and one hour ago he received in the same way $\frac{1}{4}$ grain of morphin sulphate and $\frac{1}{150}$ grain of atropin sulphate At our first operation he was somewhat nervous it being his first experience with local anesthesia. Today he elects local and comes without the slightest apprehension. (In answer to question) No 1 shall never use scopolamin again, I have used it a great deal, but I have learned to avoid it forever Nothing can ever persuade me to use even the smallest fraction of a grain in conjunction with morphin— the infiltration is carried on as before We are not going to reopen the scar however although I must infiltrate the tissues overlying the bone ends. I do the same with those lying below the level of the jaw opposite this site. I am very careful not to thrust the needle into the mouth cavity should I accidentally open the mouth cavity I shall discontinue the operation and try again later I now incise below the lower border of the jaw parallel with it and about 2 to 3 cm away from it. The cut is at least 7 or 8 cm long and its anterior end goes almost to the median line The flap is turned upward It comprises the skin

and platysma, and as it is turned up the outer aspects of the
fragments come into view   All spurting points are clamped.
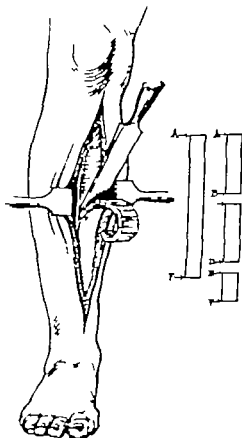
Fig. 636.—A thin disc eg of bone with its overlying periosteum is raised
from the inner surface of this   Inset   The strip A–F is cut into three pieces
—two long and one short

The knif now bares the bone ends   How little scar tissue is
present today   I must infiltrate on the deep aspect of the

fragments, and now I clean the bone ends on both aspects for at least 2 cm. A drill is now used to make two holes in each fragment. The holes made at the previous operation have been filled up and the bone drills very much more easily than it did before It is more vascular These holes are back 1 cm. from
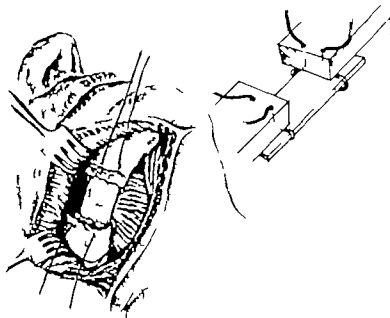
Fig 639—One of the long pieces has been laid against the inner aspect of the fragments—the periosteum turned ard—the periosteum of the ends of the fragments has been turned back, bony surface touches bony surface. Inset illustrates how the graft is caught in the catgut loops.

the ends and the top one is as high as it is safe to go for fear of injury to the mucous membrane We guard with the metal protector lest the drill slip through and wound important tructures The lower holes are near the lower border Now I shall pass a trand of catgut in through the upper and out

through the lower hole in the anterior fragment, and do the same with those in the posterior fragment. The loop of each strand I shall grasp in a separate forceps. I now make good hemostasis by torsion, if possible If not, I must use only the finest of plain catgut for ligatures—the bed is now ready for the grafts.
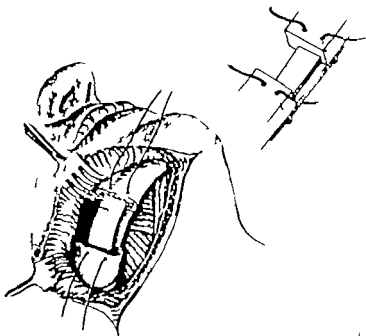
Fig. 640.—The shortest piece of shaving has been cut to fit exactly between the fragment ends. It is laid between them with or without periosteum, as you please. Inset illustrates the same.

The left leg of the patient has been already prepared. The picric acid (5 in 95 per cent. alcohol) has been painted on here W do not use it on the face because the color is retained for many days, hence the tincture of iodin diluted with equal parts of alcohol was used there Again I infiltrate along the inner

surface of the tibia all the tissues to the bone are flooded. A
linear incision about 20 cm. long is made through the tissues
down to but not through the periosteum. The bleeding is
controlled. Good retraction is made, exposing the whole width
of the internal surface of the shaft of the tibia. An incision is
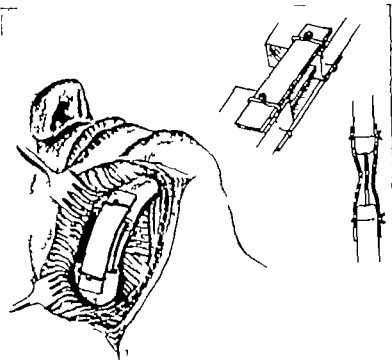
Fig 641.—The remaining long piece is laid against the outer aspects of
the fragments—periosteum outward—catgut strands are tied Inset illus-
trates the same.

now made through the periosteum about 5 mm. behind the
crest of the tibia and parallel with it from one end of the wound
to the other A second incision is made through the periosteum
2 cm. behind or internal to the first and parallel with it. The
ends of these parallel incisions are now connected by a trans-
verse cut through the periosteum. A chisel 2 cm. wide is now

used, and beginning at the upper end is driven by gentle tapping
and held at an angle of about 45 degrees. The bone shaving
begins to curl up and it curls with the periosteum inward into a
roll just as the shaving in ordinary carpentry We take enough
for the three pieces and cut it into the required lengths. We have
two long pieces and a short one. It cuts easily with the bone
shears. It is a little difficult to unfold and straighten. We
take one of the long pieces It has been cut 5 cm. longer than
the interval to be bridged. We pass one end of it—periosteum
inward to the deep surface of the anterior fragment, its end is
encircled by the loop of catgut previously placed there. Its
posterior end is placed in similar relation with the posterior
fragment and caught in that loop The catgut loops are now
tightened—not tied—and the graft is held firmly against the
mother bones—bony surface to bony surface.

The other longer piece of graft is now laid on the outer
aspects of the bones, periosteum outward Its ends lie between
the catgut strands as they emerge from the drilled holes. Each
strand is now tied and thus the two grafts are held in place by
the two strands of catgut ten-day No. 1 I now take the last
fragment and slip it underneath the outer one into the space
between the two and touching the mother bones.

W now close the wound with three figure-of-8 silkworm-gut
sutures and apply some pressure just below the jaw at the site
of operation. These measures lessen the likelihood of hema-
toma or serous exudate—either of which in this neighborhood
might easily nullify our day's work The wound in the leg
my assistant has already closed and dressed

The right aid will be similarly dealt with at a later date

CRANIOPLASTY WITH CARTILAGE

This patient is forty-nine years old a laborer until 1916 when he was shot in the head suffering the loss of his right eye and a comminuted fracture of his skull in the right parietal region since then he has done no work.

He was operated on at once and recovered in some weeks. He soon after began to have twitching spells in his left hand. The spells increased in frequency and severity and involved the whole left arm and left side of his face. He did not at first lose consciousness during the attacks. Later he had regular epileptic seizures which always began in his left hand. He was operated in another clinic in 1917 and an attempt was made to close the defect in his skull with fascia and muscle transplant, the surgeon considering it too large to repair with bone. His epilepsy was not improved and in 1919 he was again operated and a part of the motor cortex on the right side was removed. Since then he has had no more epilepsy but he is totally para lyzed in his left side. He also complains that he has dizzy spells and peculiar unpleasant feelings over the left side of his body. He has a great fear that something is going to strike him over the spot where his skull was fractured. He has severe headaches and attacks of insomnia.

Examination shows a depression in the right side of his head extending from within 1 cm of the midline downward almost to the ear and its anteroposterior diameter is almost 7.5 cm. There is easily feelable brain pulsation at the bottom of this hollow. It is quite 2 cm in depth at its center and it is crossed by two scars. He winces as the fingers pass over the scalp in this hollow although there is no sign of inflammation there. Intelligence normal.

His left eye reacts to light and accommodation and its fundus examination is negative. The right eye is missing

used, and beginning at the upper end is driven by gentle tapping and held t an angle of about 45 degrees. The bone shaving begins to curl up and it curls with the periosteum inward into a roll just as the shaving in ordinary carpentry. We take enough for the three pieces and cut it into the required lengths. We have two long pieces and a short one. It cuts easily with the bone shears. It is a little difficult to unfold and straighten. We take one of the long pieces. It has been cut 5 cm. longer than the interval to be bridged. We pass one end of it—periosteum inward t the deep surface of the anterior fragment, its end is encircled by the loop of catgut previously placed there. Its posterior end is placed in similar relation with the posterior fragment and caught in that loop. The catgut loops are now tightened—not tied—and the graft is held firmly against the mother bones—bony surface to bony surface.

The other longer piece of graft is now laid on the outer aspects of the bones, periosteum outward. Its ends lie between the catgut strands as they emerge from the drilled holes. Each strand is now tied and thus the two grafts are held in place by the two strands of catgut to-day No. 1. I now take the last fragment and slip it underneath the outer one into the space between the two and touching the mother bones.

We now close the wound with three figure-of-8 silkworm-gut sutures and apply some pressure just below the jaw at the site of operation. These measures lessen the likelihood of hematoma or serous exudate—either of which in this neighborhood might easily nullify our days work. The wound in the leg my assistant has already closed and dressed

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His left eye reacts to light and accommodation and its fundus examination is negative The right eye is missing

There is a spastic paralysis of the left side of the body and face.

The chest and abdomen show nothing abnormal. Appetite is good. Bowels normal. The urine is normal.

He acknowledges syphilis ten years ago untreated, but his blood and cerebrospinal fluid Wassermann tests are negative.

He comes to have a protective covering installed over the defect in his skull.

This is one of the largest cranial defects I have so far seen. Its longest diameters measure 2½ by 2½ inches. Almost all patients with cranial defects have some of the symptoms complained of, particularly headaches and tenderness in the area involved. I have seen some with recurring nausea and vomiting, which disappeared when the defect was repaired. Dizziness is a very frequent symptom. A peculiar and annoying symptom occurred in a fireman recently operated—he could feel his brain "pressing to get out when he turned quickly as in going around a corner Such symptoms have always disappeared after the defect had been repaired in my own cases. (In answer to a question) No, I would not be too optimistic about its being a cure for epilepsy if that were present. Epilepsy is often benefited by almost any operation you've noticed that especially in Cincinnati. If epilepsy and a cranial defect followed after a head injury I'm sure it is the part of good surgery to repair the defect first before resorting to any other operation for the cure of the epilepsy

Now as to the repair of the defect formerly a plate of metal was placed in a skull cap or hat to be worn as protection. The implantation of a plate of silver or gold under the scalp in order to replace the bone is very old procedure later in addition to these substances, vulcanite celluloid, etc., have been used. Gold is the least irritating but all are foreign bodies and undesirable

In recent years bone and later till, cartilage have been used to repair these defects.

I admit that it looks more natural to close bony defect with bone. Some insist that bone is alway to be used. Now if

the transplanted bone would always do as it ought and furnish the patient a scaffold over which his pericranium could build out a nice bridge or lid of bone to cover the defect, all would be well, and we would all soon use nothing but bone to cover these defects. But when bone is transplanted to the skull from almost any other region it ceases to functionate as it did before, and it disappears before the defect is covered with new bone. This has happened to me repeatedly. When a piece is taken from the outer table of the skull. If the defect is small or often even if it be quite large, and used, it grows into place and acts well
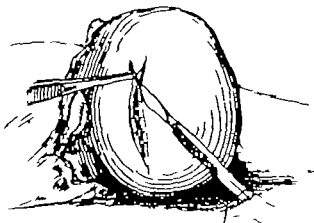
Fig. 642.—The scar is curbed completely

at least for a while. For a very large defect it is too large an operation to be undertaken especially as its success is doubtful.

Cartilage transplantation for the repair of bony defects about the head and face came into popularity during the Turco-Italian War. The late Doctor Moresth, of Paris, claimed to have been using it for upward of twenty years; but Ced of Pisa, Italy first called general attention to its utility for repairing these skeletal defects.

It is easily obtainable and can be so easily shaped to fit the desired contour that its use is at present fairly well recognized. As to its durability we cannot speak with great knowl-

edge gained through personal experience over a long period of
years. But I do know that it can remain buried in the tissues
for more than five years and not diminish appreciably in volume.
It does not seem to make any difference whether the perichon-
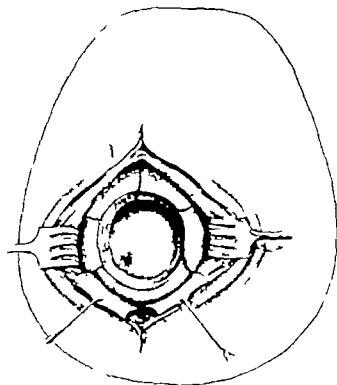
Fig 643.—Diagram to show how periosteum is retracted in flaps from around
the edges of the defect.

drium is removed or not. In cranioplasty I usually split the
rib cartilage on the flat and allow the perichondrium to remain
in situ. It is not to be expected that the cartilage will unite
directly with the bone of the skull or will change to bone. But

cut thick enough and properly applied it affords a firm protecting cover for the defect, and soon becomes very firmly fixed in place. I have no personal experience with suppuration in connection with its use in cranioplasty but I have had suppuration follow in one case where smaller pieces had been used on the face. The cartilage there healed in. However if a cranioplasty wound suppurated I would expect to lose such large pieces as we must use here

The head has been entirely shaved. We now wash it with a gauze sponge soaked in ether—no brushes are used. Then a

Fig. 644.—Cross-section a, Scalp turned back b, periosteum c, skull; d, dura or scar tissue covering brain.

mixture of tincture of iodin and 95 per cent. alcohol equal parts of each is painted all over the head. This is allowed to remain on for five minutes and then as much as possible of the iodin is removed by washing with alcohol I lay stress on this preparation because with t I have secured the necessary asepsis, and have never yet caused a dermatitis. It is a dangerous thing to have a dermatitis of the scalp follow an operation on the skull in which the dura must be exposed.

We excise the scar cutting a little at a time and catching the vessels with Kocher or Ochsner forceps as we proceed I

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the vessels with Kocher or Ochsner forceps as we proceed I

have never had satisfaction with the tourniquet applied to the
scalp. The bleeding as you see, is of no moment. We now
separate the scalp from the pericranium at the edge of the
defect. This gives us our proper plane of cleavage for separat
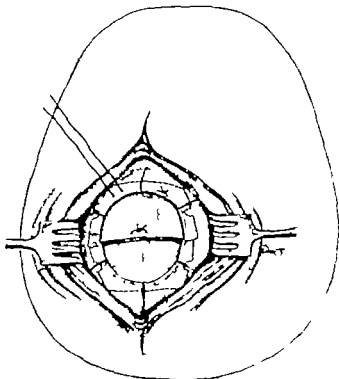
Fig. 645 —Pieces of cartilage ha   been placed in position and flaps of peri-
cranium are sutured from them.

ing the scalp from the underlying brain or dura lying exposed
in the defect. It is lifted up and the bleeding surface is, to
my eye, scar tissue I cannot recognize it either as brain or
dura. I see no need for removing it nor for separating it from

the bone at the edges of the defect. The pericranium is now incised where it lies in contact with the dura or scar and it is freed from the skull back for 2 cm. from the edge of the defect. It is necessary to make a few incisions in it, radiating outward from the free edge as shown in Fig 643 Any bleeding points in the dura or scar exposed in the defect are carefully controlled either by torsion or ligature. There must not be a hematoma formed in the wound after it is closed Gauze pressure is now gently applied and held in place while the cartilage is procured.
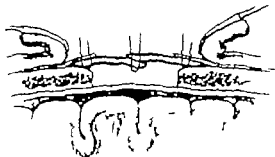
Fig. 648.—Cross-section illustrating position of cartilage

A glance at Fig. 648 (sketched from a skeleton) will show that there are several points where broad pieces of cartilage may be obtained We make an incision obliquely downward and outward beginning at the fifth chondrosternal joint on the left side. The wound is about 3 inches long The rectus is drawn inward and here are two cartilages apparently grown well together They are removed with their perichondrium intact and without opening the pleura. I now commit this wound to the care of my assistant who will close it without drainage after making careful hemostasis.

The two cartilages you see are to all intents, only a single piece. The defect is 2½ inches long by 2¼ inches wide. The

VOL. I—

cartilage removed is about 3½ inches long by 1½ inches wide. I will split it on the flat. Notice how it curls the cut surface convex. We now insert them into their future bed and find

Fig. 617 —I ill be noticed that there are several points here one can obtain pieces of cartilage of considerable width has one cartilage is not ide enough.

that their edges must overlap a little The perichondral sur face is turned toward the brain—they fit better that way They are held in place by catgut sutures passed through their ends (which have been beveled t the expense of their outer surface)

and through the pericranium thus their ends are covered by pericranium. The bits of bony rib left attached to the end here will soon fuse with the underlying bone

Fig 648 —Illustrating manner in which the cartilage is to be split.

The scalp flaps will hardly close We undercut it passing the scissors through the loose areolar layer and it is closed w th interrupted silkworm-gut sutures. It seems too tight, so I will go well back from the medial edge and make an incision through the scalp parallel with the suture line. This opens the

cartilage removed is about 3½ inches long by 1½ inches wide. I
will split it on the flat. Notice how it curls the cut surface
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with interrupted silkworm-gut sutures. It seems too tight, so
I will go well back from the medial edge and make an incision
through the scalp parallel with the suture line This opens the

areolar layer through which we just swept our scissors, and as the incision gapes the tension is removed from our suture line. We dress the wounds with iodoform gauze.

Postoperative Note.—The wounds healed per primam. All sutures were out by the sixth day. On the second day the patient became drowsy. He had been given bromids, and these were discontinued. He remained drowsy for ten days and was then given salvarsan (Wassermann negative). In two days he was much better. He was given salvarsan once a week for three doses. His whole character seemed changed, and he showed some return of function in the left arm and leg.

He was seen in 1921. He had not recovered the use of his left side but he had no more headache or dizziness or the fear of injury and was able to care for himself. The covering was strong and firm.

CLINIC OF DR. FRED W BAILEY

St John's Hospital

GASTROTOMY FOR LARGE OPEN SAFETY-PIN

Summary Congenital defect of abdominal wall. Repair as described on second day Recovery Large safety-pin swallowed when two years old. Fixed in stomach wall. Delivered without incision by rotation method.

Baby St. Jean.—The first case presented is of unusual interest in that it is a second visit to the operating room for a baby two years old. I will refer briefly to the previous operation because it seriously complicated the present one.

When born (December 18, 1920) the attending obstetrician, Dr Percy H. Swahlen found a congenital defect of the abdominal wall. An ovoid area involving two-thirds of the space between the ensiform and pubes was covered only by peritoneum dark in color the infant cried continuously the area bulged like a toy balloon during every exertion, and rupture seemed imminent. Skin, fascia, and muscles were entirely absent.

The defect comprised so large a proportion of the abdominal wall that hope of repair seemed futile but was attempted by the following technic

Under light ether anesthesia the infolded skin margins of the entire circumference were gently separated from the peritoneum and border pared From the upper and lower pole of the defect the skin was incised to ensiform and pubes. By blunt dissection, with all pressure directed against the skin, an under mining process involving the entire anterior lateral, and posterior walls to the erector spina group was accomplished. This permitted a snug approximation of the skin over the defect under reasonable tension, without blanching A running suture of chromic 0 gut, with a few tension sutures and adhesive strips

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to relieve the suture line, succeeded in holding until the repair was complete.

The baby lived an uneventful life for two years, developing normally A snug flannel binder was constantly worn to control the slight bulging This protector proved to be a menace, for two days ago during a period of self-entertainment, the binder was shifted a large saf ty-pin selected, and promptly swallowed.

Fig. 649 —Showing degree of bulging during act of crying

The size of the companion pins and the fact that the swallowed pin remained high in the cardia for over twenty four hours influenced me to urge its removal while conditions were fa or able. In a similar case operated within the ear we found the pin point piercing the *mucosa of the stomach wall all but* perforating the serosa

Operation —The child is now ready and we will remov the

Interloper You will note the respiratory bulging is not ex
cessive. The umbilicus was marked only by a peritoneal pro
trusion near the lower angle, and is, of course absent. The
old scar is now excised A thin fascial layer has developed
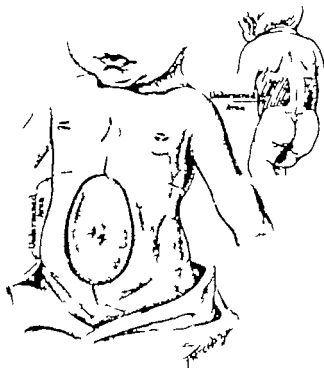
Fig. 650 —Congenital defect of intraumal wall. Skin margins in estid.
Entire bulging wall consisted of transversalis fascia and peritoneum only
Shaded areas indicate undermining of skin for sliding flap Horizontal dotted
lines indicate line of incision Skin edges of defect circumference freshened.

between the skin and peritoneum. No attempt will be made
to separate the fascia and peritoneum and the skin dissected
only far enough to accommodate a buried suture line. The
presenting stomach fills the incision ∖ intraperitoneal ad-

to relieve the suture line, succeeded in holding until the repair was complete.

The baby lived an uneventful life for two years developing normally A snug flannel binder was constantly worn to control the slight bulging. This protector proved to be menace, for two days ago during a period of self-entertainment, the binder was shifted a large safety-pin selected and promptly swallowed.

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Oper tion.—The child is now read and we will remove the
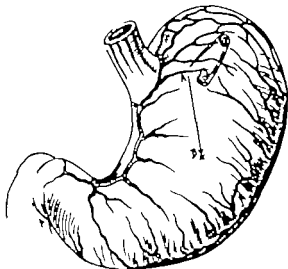
Fig 632.—First position of pin shows ing point engaged in mucosa.
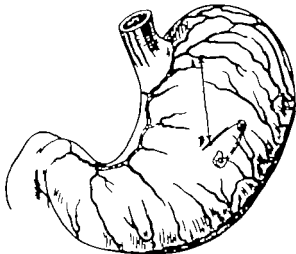
Fig 633.—A Original slit of pin *B* slit at hich delivery as effected.

rotated through the opening the hinge and head following the point, as you will see without tearing the serosa. The thumb and

hesions are demonstrable The stomach wall is now gently palpated bimanually between both thumbs and forefingers, beginning at the cardia and carried out slowly and systematically My right hand has located the pin high in the left angle. An attempt to bring it down proves the point is buried. The point can be felt just beneath the serosa. The pin is now in-
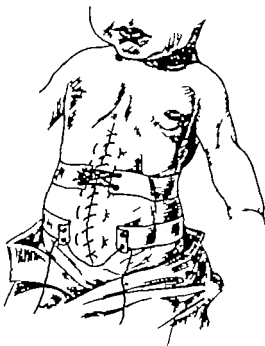
Fig 651 —Skin-flaps adjusted and sutured Closure at midline Adhesive strap for relief of tension.

verted and carried down by pushing the stomach walls up with the free hand, never releasing the pin

A blood-free area on the anterior stomach wall is now selected The pin point is forced to penetrate and is grasped by a clamp The delivery of the pin will be made without an incision, permitting the pin to dilate the original puncture By holding tightly the stomach wall at the point of delivery the pin is
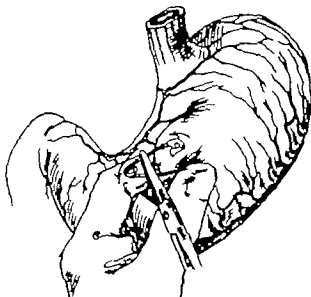
Fig. 653 —Rotation and delivery of elbow
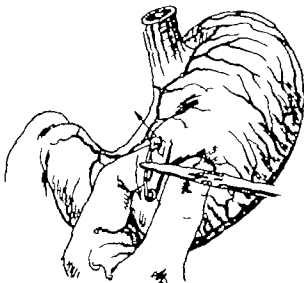
Fig. 654 —Continued rotation and delivery of pin head through dilated puncture wound.

fingers meantime effectually control the stomach contents. The
pin is now delivered and the opening, you see, contracts almost
to invisibility It is grasped by an Allis clamp one fine gut
suture pierces both serosa and mucosa, and is tied. A primary
purse-string suture invaginates the puncture and is followed
by one or two more as indicated. The stomach is replaced and
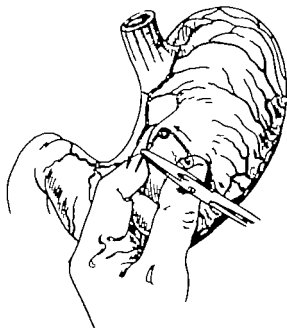
Fig 654.—Pin disengaged and carried down buccanally to blood-free area
and point brought through for delivery

the peritoneum with its thin fascia sutured. The first suture
is an edge-to-edge running suture of No 0 chromic gut, rein-
forced by a relaxing suture of N 1 twenty day The skin is
now approximated and an adhesive dressing extending from the
spine on either side applied. A flannel binder must be con-
stantly worn, obtaining a constriction directed from the spine
forward t overcome fatal tension on the suture line
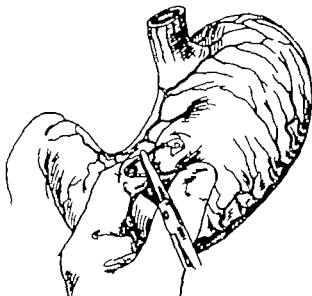
Fig. 655.—Rotation and delivery of elbow
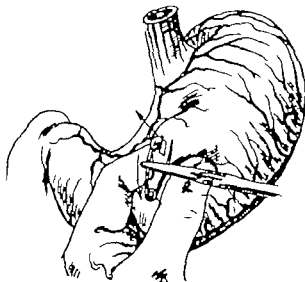
Fig. 656.—Continued rotation and delivery of pin head through dilated puncture sound.

You will note the pin point stands a full inch from the head. Aside from the fact that perforation of the stomach wall was imminent, it is very unlikely that the small intestine could
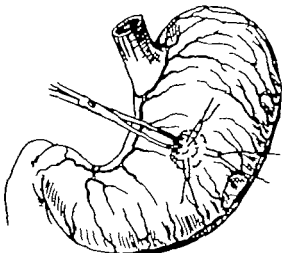
Fig. 457 —Opening immediately contracts and is closed by one through-and-through catgut suture and purse-string.

ha e accommodated this rude visitor to the normal exit. Note: Recovery uneventful bulging of wall less than before child discharged cured within three weeks from entry

REPAIR OF DUODENAL PERFORATION. CHOLECYSTOTOMY FOR GALL-STONES

Summary Perforated duodenal ulcer complicated by gall-stones, with light jaundice. Abscess evacuated, perforation sutured, gall-stones removed. Gall-bladder not removed because of adhesions and tumor overlying common duct. Common duct obstruction relieved by operation and gall-bladder drainage ceased in normal period. Recovery without gastro-enterostomy or other procedure.

Mr W W —This patient has been under medical care for several years. He comes to operation with a diagnosis of gall-bladder disease, complicated by duodenal ulcer with possible perforation. He has suffered several hemorrhages and attacks simulating imminent perforation. You can see by his general appearance that he is markedly emaciated. This is believed to be due to his inability to digest and assimilate his food and not to an emaciation which usually accompanies malignancy There is a palpable mass near the midline, involving the space in the right subcostal angle. An oblique right rectus incision is now made the rectus muscle which you see is quite attenuated is divided by blunt dissection and the peritoneum opened There are adhesions to the parietal peritoneum. The margin of the liver is low and is firmly adherent to the mass underlying it, mesial to the gall-bladder the tip of which is exposed. Before disturbing this pathology I will make an excursion of the abdomen There are no palpable tumors or glandular enlargements, no abdominal adhesions except in the upper right quadrant. The operation thus far has been conducted under local anesthesia. The anesthetist will now administer gas-oxygen to the analgesic state. The patient's condition does not warrant ether anesthesia. You will note that the local anesthetic has obtained complete abdominal relaxation The mass is now elevated and the adhesions gently divided in the cleavage line the gall-bladder is now exposed to the common duct and contains several large

stones. The transverse colon liver gall-bladder pyloric end of the stomach, and duodenum all participate in this mass. While separating the transverse colon from the liver margin an abscess has been liberated. This is quickly sponged away without contaminating the general peritoneal cavity which is also protected by flat sponges. The abscess leads to the anterior surface of the first part of the duodenum, at which site an oval opening is seen

Fig. 658.—Duodenal perforation complicated by cholelithiasis Site of abscess (omentum covered). Infected gall-bladder ith gall-stones.

from which flows the duodenal contents Approximately an ounce of pus has been liberated. The duodenum is considerably thickened the opening is now closed by a light purse-string suture and infolded by a transverse suture thus shortening the duodenum, but not materially contracting the lumen. You will note that one finger passes readily Adhesions overlying the second part of the duodenum common duct and inferior liver

surface are now free the omentum is sutured over the site of
the ulcer the gall bladder opened sponged dry and several
gall-stones of large size removed   Free drainage of bile into the
gall-bladder follows this removal   A gall-bladder drain is now
inserted and held in position by a purse-string suture a cigarette
drain is placed over the old abscess site and another leading
from the cystic duct area   the abdomen is now closed in layers
the three drains leaving at a common exit.   The skin is now
closed and the patient will be awake and able to speak to us in
less than three minutes.   There has been a minimum amount
of shock attending the operation his abscess has been relieved
the perforation at least temporarily controlled and gall-stones
removed with a free exit for bile and the patient will be given
an opportunity to sufficiently recuperate so that any future
procedure which may be indicated can be carried out with
safety   The surgical judgment of the operator in cases of duo-
denal perforation must determine the magnitude of the opera-
tion.   Removal of the ulcer site by excision or resection is surely
more ideal than the simple procedure you have just seen carried
out.   The lowered vitality in this particular case would dis-
tinctly contraindicate at least all unnecessary operative shock
It is not believed that a gastro-enterostomy is necessary at this
time   The section taken from the ulcer area is to be examined
for possible carcinoma, and our further steps in this case will be
guided by the laboratory findings and the patient s progress.

Note.—Patient made a rapid recovery and was discharged
in twenty days with drainage wounds entirely healed.   The
laboratory findings were negative for malignancy   Patient at
this time nearly two years from the time of operation, is able
to attend to his work and has regained his normal strength.

JEJUNOSTOMY INOPERABLE CANCER OF STOMACH

Summary Abscess of lateral wall over ninth and tenth ribs proved to be result of spontaneous perforation of stomach from carcinoma of fundus. Jejunostomy for relief of inanition and dehydration. Death.

Mr T—The history of this patient will interest you more than the operation, which is to be merely exploratory with a jejunostomy under local anesthesia. Before the patient is brought in a brief résumé will be given.

Over two months ago he came to St. John's Hospital complaining of an abscess of the left side. We found a large bulging fluctuating tumor which had dissected the skin from the ribs and lateral abdominal wall. It was incised under local anesthesia and about 1 pint of pus of colon bacilli odor was released. The base of the abscess between the eighth and ninth ribs had the feel of granulation tissue. The patient had given a history of an injury to the side several weeks previous. The abscess was dakinized and healed within a short time. About two and a half weeks afterward he re-entered the hospital for the same condition the old wound having opened. Under local anesthesia the sinus was enlarged and Dakin tubes again inserted. About one week afterward patient stated that he felt everything taken into the stomach pass through the opening into the dressing. A test was made with coffee and it appeared through the discharging sinus almost as rapidly as it was taken by mouth. A section of the floor of the cavity was immediately sent to the laboratory and proved to be carcinoma.

Operation.—This is evidently a case of carcinoma of the stomach which has spontaneously perforated. The object of the operation is to explore and to provide a method of relieving inanition temporarily by means of a jejunostomy The left rectus area is now blocked by local infiltration and the abdomen opened. The parietal peritoneum over the splenic area is tightly adherent to stomach and transverse colon. The margin of the

stomach leading into the abscess area is thick, nodular and
infiltrated. This process extends upward over the entire fundus
and is obviously inoperable. The proximal loop of the jejunum
is brought into the wound and a No 20 French catheter is
passed through a transverse slit and invaginated by a purse-
string and reinforcing Lembert sutures. Fluid will be immedi-
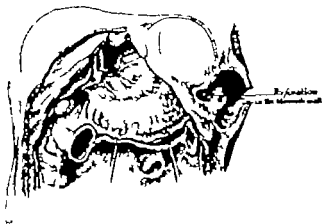
Fig 659 —Spontaneous perforation of stomach (carcinoma) Site of perfora-
tion Abscess cavity Area of stomach involved

tely given the patient and pushed as rapidly as accepted Ab-
dominal wound is closed bout the tube without drainage and
an adhesive dressing similar to that used in catheter retention,
is applied

Note —P tient lived but few days Postmortem showed a
leather-bottle cancer involving the entire fundus with spon
taneous perforation and abscess.

1. ACUTE OBSTRUCTION RESECTION OF GANGRENOUS LOOP 2. ILEOCOLOSTOMY

Summary Acute obstruction with abscess and gangrenous loop of ileum. General peritonitis. Dissection. Artificial anus for three and a half weeks. Intestinal continuity re-established by ileocolostomy switching around terminal ileum, cecum, and ascending colon. Recovery and return to normal state of health

Master D C —This young patient is eight years of age He entered the hospital about three weeks ago He was at that time suffering from an acute intestinal obstruction with a palpable tumor to the left of the median line below the umbilicus. Several weeks ago he had been operated presumably for a pus appendix. Am informed by his father that his appendix was removed and drains inserted, but that it failed to drain for nearly two weeks the temperature continuing and the soreness at the site of this present tumor remaining He states that drainage began and continued at intervals and that his pain in the left side always disappeared while drainage was active. This history if accurate fairly well proved that the appendix was not the original site of infection. Upon his entry three weeks ago an incision was immediately made for the purpose of relieving the obstruction. Four degrees of temperature and a high white count with the presence of the tumor established the existence of a peritonitis attending the obstruction. Upon opening the abdomen over the tumor a mass of intestinal loops and omentum were revealed In separating them an abscess was released (foul smelling) streaked with blood. It was necessary to continue the exploration until the cause of obstruction was located. This proved to be a 12-inch loop of ileum, about 20 inches from the cecum which had undergone volvulus had become adherent, and its circulation completely cut off The loop was black and was leaking its contents from an opening at the apex. It was immediately withdrawn and excised leaving the two well circularized lumens attached in the abdominal opening Drain-

age was instituted in culdesac and both flanks and the patient put to bed, given freely of soda and glucose, 3 per cent. each, intravenously and axillary seep until immediate postoperative shock was overcome He traveled on thin ice for several days, but gradually improved and at this time, less than a month, the peritonitis is under control drains removed and we believe it
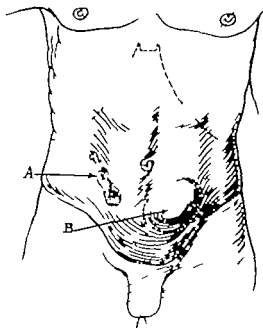
Fig 660 —Case of Master D C A Depicting old drainage scar following appendectomy without relief of symptoms B, site of feeble tumor kick drained intermittently through lower angle of scar

possible to put his intestine back into commission He will be given gas-oxygen anesthesia and we will work as rapidly as possible on account of his age and physical condition The skin surrounding the artificial anus is severely excoriated It will be covered by vaselin gauze strips and will heal rapidly If x are successful in removing the cause The old wound is completely

excised and the skin undermined sufficient to close without
tension. The excised area included both proximal and distal
openings, and they are now closed by clamps which also act as
retractors. After careful protective toilet of the skin margins
the dissection is carried down to the peritoneum at the upper

Fig 661.—Left rectus incision—omentum retracted   because cavity in
loop of gangrenous ileum relieved. Interintestinal adhesions profuse and
fibrous.

angle of the wound sufficiently far from the affected area to
enable us to enter without fear of further injury   Once within
the peritoneal cavity the exploring finger can sweep the per
itoneal adhesions free and the delivery is completed without
danger   You will note the great size of the proximal gut in com-

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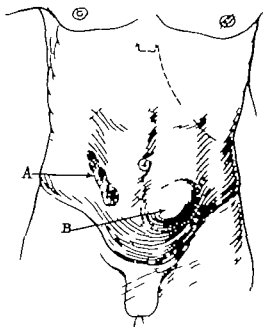
Fig 660 — Case of Master D C A Depicting old drainage scar following appendectomy without relief of symptoms B, site of white tumor which drained intramuscularly through lower angle of scar

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given gas-oxygen anesthesia and we will work as rapidly as pos-
sible on account of his age and physical condition. The skin
surrounding the artificial anus is severely excoriated. It will be
covered by vaselin gauze strips and will heal rapidly if we are
successful in removing the cause. The old wound is completely

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Fig. 661.—Left rectus incision—contents retracted because ca ity loop of gangrenous ileum relieved. Interintestinal adhesions profuse and fibrous

angle of the wound sufficiently far from the affected area to enable us to enter without fear of further injury Once within the peritoneal cavity the exploring finger can sweep the per itoneal adhesions free and the delivery is completed without danger You will note the great size of the proximal gut in com-

parison to the shriveled distal section. Before determining upon our next step it is necessary to be sure that no point of ob-
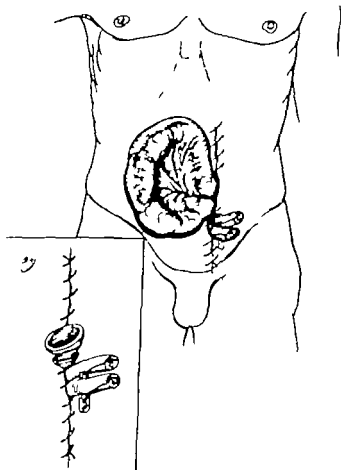
Fig 662 — Gangrenous loop   with   drainage established, and wound adjusted Insert Amputated proximal and distal gut

struction lies between the anastomosis and the normal exit otherwise our work will be for naught The collapsed distal

ileum is traced to the cecum. There are numerous fibrous ad
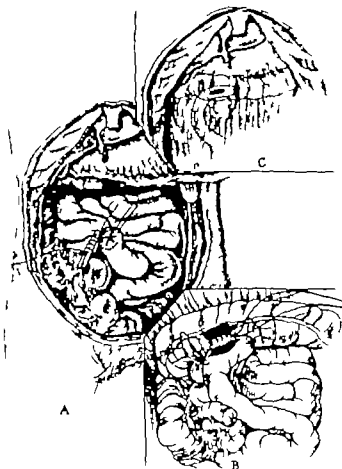
Fig. 663.—A, Second operation (four weeks later) Multiple occlusions of terminal ileum and ascending colon. Proximal and distal gut trimmed, both openings invaginated by suture. B Lateral ileocolostomy along white line of transverse colon C, Position of anastomosis with viscera replaced, no kinking of ileum.

hesions which cannot be released without danger of injury to the bowel wall. The cecum itself and two-thirds of the ascending

colon are involved in a mass of adhesions which appear to me likely to obstruct the lumen and can be released only with considerable difficulty and danger   It is my intention, therefore, to invaginate and close permanently the end of the lower loop and to anastomose the proximal ileum to the transverse colon. The mouth of the proximal ileum is invaginated by purse-string of hard chromic gut, reinforced by Lembert sutures. The transverse colon at the selected site and the ileum is grasped by four Allis clamps and the anastomosing clamps applied. From this point the procedure is identical with that of a gastroenterostomy chromic gut, hard, is used throughout and a rapid union with a large lumen effected. The end of the ileum is directed to the left so that the cecal current may not be discharged. The anastomosis is now completed and the protecting posterior suture carried around the entire circumference of the inverting continuous mattress. The abdomen is closed without drainage and vaselin gauze applied over the denuded area. Note This patient made a slow but steady recovery and was discharged from the hospital cured about seven weeks following the last operation. His appetite is excellent and purgatives are not required.

The 4 cases reported above selected from various clinic days offer but slight opportunity of demonstrating any unusual technic. They were selected because they presented conditions and pathology somewhat unusual in character and demanded a conservative form of radical surgery

The prime object of surgery is to relieve distress and t the same time conserve life. A finished technic must ften be sacrificed for the sake of expediency By careful preparation for operation, combating shock before it has chance t develop, instituting two or more stages if ad isable in serious cases and by zealous postoperative supervision, many cases that are bad risks in the beginning can be graduated to the safe risk class and finally result in success.

CLINIC OF DR. BARNEY BROOKS

BARNES HOSPITAL

—

TWO CASES OF ANEURYSM

CASE I. ANEURYSM OF THE EXTERNAL ILIAC AND FEMORAL ARTERY

THE first patient to be presented in this clinic is one who is interesting to us from several viewpoints

First Aneurysm involving this particular vessel is rare.

Second Aneurysm at the particular site at which this one occurs presents the combined problems of cure of the aneurysm and safety of the extremity

Third It was for a condition simulating this condition to be shown that the treatment instituted in this case was first carried out in a brilliant operation by a resourceful surgeon who practised in this country before the days of anesthesia or asepsis.

Fourth This case has been under careful observation now for a period of one year since she was operated on by us and we therefore have not only the opportunity of a discussion of diagnosis and several possible means of treatment, but we shall have an opportunity of seeing the results of the method of treatment chosen at a time sufficiently remote that we may judge as to its value in this and similar cases.

This patient is a woman forty four years old who first presented herself to us on May 1 1921 complaining of a lump in her right groin which had been noticed by her six years previous to the time we first saw her The lump had slowly increased in size and had during the year previous to her coming to us, been associated with great pain in her right thigh and leg

She was a seamstress by profession. She had been forced to abandon her means of livelihood and indeed had spent most of the six months previous to her first visit to us in bed on account of the severe pain associated with the tumor in her groin.

Fig. 664 —Photograph of Case I showing the position of the aneurysmal tumor

She was admitted to the Barnes Hospital on May 4 1921 On examination t this time the following findings are of interest to us. The patient was a well nourished woman of forty three

years, whose general examination other than that associated with the lesion under discussion was that of a well woman. In the right groin was a large visible tumor (Figs. 664 665) The

Fig. 665.—Photograph of Case I showing the position and size of the aneurysmal tumor

tumor occupied all of the space of Scarpa s triangle and could be felt to extend above the level of Poupart s ligament. There was a visible and palpable expansile pulsation in the tumor On

auscultation there was a loud systolic bruit which could be
heard over the tumor and along the course of the femoral artery
in Hunter's canal. The veins of the leg and thigh were somewhat
distended and there was marked edema of the right leg There
was anesthesia corresponding to the distribution of the femoral
nerve. There was however no continuous humming bruit to
be heard over the tumor That the tumor was an aneurysm was
proved by the fact that the tumor occupied the position of a
large artery it had an expansile pulsation, and there was loud
blowing murmur

DR. BROOKS What sorts of aneurysmal tumors are there?

STUDENT Aneurysms in involving the artery alone, and aneu-
rysms in which there is a fistula between the artery and vein.

DR. BROOKS What particular characteristic was absent in
this case which made it unlikely that this was an arteriovenous
aneurysm?

STUDENT The fact that there has been no penetrating wound.

DR. BROOKS The absence of a history of a penetrating wound,
the fact that there was not a continuous humming murmur
heard and the absence of a positive venous pulse in the veins
of the neck made it certain that we were not dealing with an
arteriovenous fistula. The continuous hum, sometimes so loud
as to be heard without stethoscope or putting the ear against
the patient, which is almost always associated with very dis-
tinct, palpable thrill, is almost pathognomonic of an arterio-
venous fistula In case of a tumor similar to this one the
presence f a communication between the artery and ein was
proved beyond all question of doubt by the demonstration of a
positive wa e in the venous pulse tracing from the neck ems.
This wave was produced by the systolic rush of blood into the
femoral vein which sent a wave along the ena ca a t the eins
of the neck

Having thus ruled out the possibility of this ha ing been an
arteriovenous aneurysm what ther differentiation may be done

STUDENT It should be determined whethe the aneurysm is
a false or true one

DR. BROOKS How may this be done

STUDENT: It can be done only by an exploratory operation.

DR. BROOKS: I think it can be said with almost certainty that any aneurysm which has developed spontaneously and slowly is a true aneurysm. What other sorts of aneurysm may be differentiated?

STUDENT: Fusiform aneurysm and saccular aneurysm.

DR. BROOKS: Which sort is this most likely to be?

STUDENT: I think it may be a saccular aneurysm from the manner which it presents itself externally.

DR. BROOKS: No I do not think this aneurysm is of the saccular type. It extends a considerable distance along the course of the artery. It has no to-and fro murmur which is likely to be associated with a sac communicating with the artery by a defect in only one wall of the vessel, and a true saccular aneurysm is very rarely spontaneously developed particularly at any other site than in the heart or aortic arch.

Having now arrived at the conclusion that this was a fusiform aneurysm of the distal portion of the external iliac and proximal portion of the femoral artery we may visualize the anatomic pathology and begin the consideration of the possibilities of relieving the disease by surgical measures. It can readily be seen that this aneurysm occupies what may be called a most dangerous portion of the arterial supply of the lower extremity for obliteration. May I ask why this statement is made?

STUDENT: Because it is located at a site which makes the control of hemorrhage extremely difficult.

DR. BROOKS: Yes this is true. But the point I had in mind is this. In dealing with this condition two problems are up to be solved and it so happens that a complete solution of either one excludes a complete solution of the other. Problem one is the cure of the aneurysm. Problem two is the safety of the extremity from gangrene. The only way we can feel sure of completely curing the aneurysm is the complete obliteration of the entire aneurysm sac. If this is done it is very likely that the first portions of the profunda and deep epigastric arteries will be occluded and this would block the chief avenues of collateral

auscultation there was a loud systolic bruit which could be heard over the tumor and along the course of the femoral artery in Hunter's canal. The veins of the leg and thigh were somewhat distended and there was marked edema of the right leg There was anesthesia corresponding to the distribution of the femoral nerve. There was, however no continuous humming bruit to be heard over the tumor That the tumor was an aneurysm was proved by the fact that the tumor occupied the position of a large artery it had an expansile pulsation, and there was a loud blowing murmur

DR. BROOKS   What sorts of aneurysmal tumors are there?

STUDENT   Aneurysms involving the artery alone, and aneurysms in which there is a fistula between the artery and vein.

DR. BROOKS   What particular characteristic was absent in this case which made it unlikely that this was an arteriovenous aneurysm?

STUDENT· The fact that there has been no penetrating wound.

DR. BROOKS   The absence of a history of a penetrating wound, the fact that there was not a continuous humming murmur heard and the absence of a positive venous pulse in the veins of the neck made it certain that we were not dealing with an arteriovenous fistula. The continuous hum, sometimes so loud as to be heard without   tethoscope or putting the ear against the patient, which is almost always associated with a very distinct, palpable thrill is almost pathognomonic of an arteriovenous fistula. In   case of a tumo   similar to this one the presence of a communication between the artery and vein was proved beyond all question of doubt by the demonstration of a positi   wav   in the venous pulse tracing from the neck vens. This wave was produced by the systolic rush of blood into the femoral vein which sent a wav   along the ena cava to the veins of the neck.

Having thus ruled out the possibility of this having been an arteriovenous aneurysm, what other differentiation may be done?

STUDENT   It should be determined whether the aneurysm is a false or true one.

DR. BROOKS   How may this be done?

pected to preserve the vitality of the extremity that we would
be forced to adopt some method which would preserve the whole
or part of the aneurysm as a channel for blood to flow through.
Now what method offers this possibility?

STUDENT The Matas operation.

DR. BROOKS Yes, theoretically the Matas operation, in
which the aneurysm sac is opened and imbricated in such a
manner as to preserve a channel through the site of the aneurysm
theoretically accomplishes this result. We feel, however that
practically this channel so frequently becomes obliterated by
thrombus formation that it is an unwise surgical procedure.

STUDENT Why is it unwise? It would seem that if the
channel remained open all would be well while if it became throm-
bosed nothing would be lost.

DR. BROOKS The thrombosis of an artery is always attended
by a much greater risk of gangrene than a ligation of the vessel
because a thrombus once started in an artery often obliterates
the vessel for a long distance, and even more important still, the
thrombus often extends out into the branches of the vessel and
thus blocks the collateral circulation as well as the primary
artery.

We, therefore felt that in this case we were forced to accept
one of two methods, and I may add that the carrying out of
either method practically committed us to stick to the method
chosen because once one was used the other became useless or
dangerous.

(1) The first method would consist in obliterating the aneu-
rysm sac and taking the risk of losing the leg from gangrene.

(2) The second method would consist in an attempt to keep
the aneurysm sac and reduce the pulse-pressure of the stream of
blood flowing through it to such a point as to inhibit the further
growth of the aneurysm but not to reduce the flow so much as
to cause gangrene of the extremity.

The second method was chosen in this case In other words
we believed it was probably better to have some aneurysm
and a leg than no aneurysm and no leg Anybody can cure an
aneurysm if it can be exposed but the cure of the aneurysm

circulation (Fig 666) I think the danger of losing the leg by
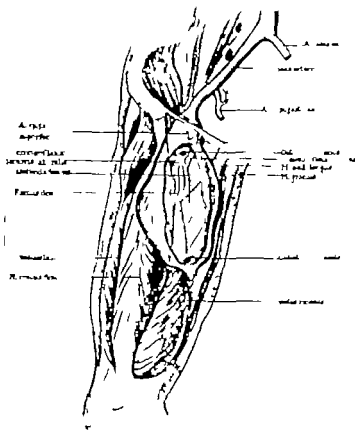
Fig 666—Case I Dra ng show he probable relationship of the
aneurysmal sac and the branches of the femoral artery in Scarpa triangle
Also note the marked increase in diameter of he right common iliac This
was observed at the time of operation.

gangrene would thus be ery great indeed. In fact, I think it
would be almost certain It would seem therefore if w ex

extremity but it seemed as if we had good reason to believe this decrease in volume flow would not be sufficient to result in gangrene or serious anemia.

With this idea, therefore on May 10 1921 we opened the patient s abdomen and ligated the right common iliac artery The ligature was placed half way between the bifurcation of the aorta and the origin of the hypogastric artery

The result of this operation was that immediately on tying the ligature pulsations in the aneurysmal tumor apparently completely ceased. By the time however the abdomen was closed a faint pulsation in the aneurysm could be made out. The sac was much less tense. During the next forty-eight hours the pulsation became slightly more marked but was very much less than before operation. At the present time thirteen months after the operation, you can see and feel pulsation in the aneurysm. I cannot see that it has increased beyond what it was a few days after operation. Since operation the aneurysmal tumor has decreased in size the girth of the thigh over the tumor being now 10 cm. less than before operation The pain was immediately relieved and has not recurred Also the edema of the leg disappeared and has not returned The anesthesia of the areas supplied by the femoral nerve has recovered We may now say the patient has an aneurysm It is not increasing in size. In fact, it is growing smaller It is not painful Finally most important of all, has a good functioning lower extremity There are however certain signs and symptoms of decreased circulation in this extremity

What is meant by the term 'ischemia or 'ischemic ?

STUDENT Ischemia means without blood for example, Volkmann s ischemic paralysis is a condition in which there is a muscular paralysis due to lack of arterial blood

DR BROOKS Your answer I believe, is in accord with the usual idea, but ischemia does not mean "without blood It is derived from two Greek words meaning to stop blood This distinction from anemia should be clearly kept in mind Volkmann s ischemic paralysis is not a paralysis due to lack of arterial blood but is an acute myositis due to an acute venous

without endangering the extremity is a task requiring more than mere surgical dexterity

What methods have been used to restrict the blood flow through an aneurysm sac?

STUDENT Digital compression.

DR. BROOKS Digital compression of the vessel proximal to the aneurysm is the oldest method of treatment of aneurysm. But the idea of this method is the temporary stoppage of blood flow in the aneurysm and obliteration of the sac by the clotting of the blood in the sac. It is sometimes successful, but, unfortunately cure of aneurysm by this method is uncertain and the risk of gangrene is greater than with other methods. I had in mind particularly the method introduced by Halsted, in which constricting bands were applied to the vessel proximal to the aneurysm. I believe Halsted method was particularly aimed at the so-called development of collateral circulation, a principle about which I am somewhat skeptical Halsted, however made another contribution to our knowledge which was of great use to us in the treatment of this patient. In the Johns Hopkins Hospital Bulletin of 1913 he showed by a careful study of all the recorded cases of ligation of the common iliac artery that this procedure was not to be looked upon as one seriously endangering the leg to gangrene With this knowledge we tried two years ago ligation of the common iliac artery preliminary to hip-joint amputation and in 3 cases in which we did amputation through the hip-joint we had an opportunity of observing the bleeding from the great vessels in the thigh after complete occlusion of the common iliac artery In these cases the large arteries bled freely when opened The bleeding however was in a stream with no visible pulsation. The pressure in the vessels was surprisingly high but the diastolic and systolic pressures were near together If therefore occlusion of the common iliac artery leads to marked diminution in the pulse-pressure in the femoral artery we felt that such condition might materially benefit if not cure an aneurysm of the femoral artery It goes without saying that this diminution in pulse-pressure would be expected to decrease the efficiency of the circulation in the

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obstruction. The arterial blood flow must be good for the condition to develop. This patient, however shows very well indeed a condition which, I believe, is correctly termed ischemia. She has no paralysis. In fact, she has no symptoms when she is at rest. When she has walked for a considerable distance (five to six city blocks) she states that the leg becomes "heavy" and that she has cramping pains in her right calf." This condition is worse in winter than in summer. As you feel of her legs you will note that the right leg is always cooler than the left. This condition can be very easily reproduced any time by ligature of the abdominal aorta of a dog. After such an operation the animal seems perfectly normal as long as he does not exert himself, but after running even a short distance his hind legs become completely useless. They recover after a short rest. This condition is the result of a circulation which is sufficient for preservation of vitality but is incompetent to remove the waste products of active muscle exertion. It is a phenomenon of fatigue. It is exactly the phenomenon you have all reproduced in the physiologic laboratory with the nerve muscle preparation.

There is just one other point I wish to make. This is one which, I believe, is known to physiologists, but I do not believe clinicians have appreciated it as yet.

If you will feel of this aneurysmal tumor you will note it is tense, but that it pulsates little. This means that the pressure of the blood in the vessels distal to the aneurysm is not greatly reduced from normal. But the fact that pulsation is very small means that there is little change in the pressure during each cardiac cycle. In other words, the diastolic and systolic pressures are nearly the same. The pulse-pressure is small. Circulation, or volume flow of blood through tissue depends on *pulse pressure* We have found experimentally that the extremity of dog may actually become gangrenous with an intra-arterial pressure closely approximating normal. In such cases the diastolic pressure is increased until it almost coincides with the systolic pressure.

This case therefore is one which brings out very clearly a

principle which I feel is too often forgotten in surgery   No
surgical procedure should be undertaken by anyone who is not
prepared to visualize his patient clear through to the end
Never become so much interested in an aneurysm that you
forget the extremity nor so much concerned with the extremity
that you forget the patient.

CASE II. ANEURYSM OF THE ARTERY COMMUNICATING THE PLANTAR AND DORSALIS PEDIS ARTERIES

THE second case to be presented is interesting particularly
from two viewpoints

(1) It is an extremely rare if indeed not a unique case

(2) The problem of treatment is entirely different from the
case already presented.

This patient is a man sixty-eight years old who comes to
us for relief of a painful tumor on the dorsum of the left foot.
The past history of this patient is of no importance concerning
the present illness except that there is a complete absence of
any evidence of venereal disease. Two years ago a heavy wagon
wheel passed over the left foot. The patient states that im-
mediately after the injury a swelling was noted on the dorsum
of the left foot, and that this swelling has as far as he can deter
mine, not changed in external appearance to the present day
Several times the patient has noticed that the swelling became
hard for a few days but it has always become soft again. Dur
ing the past few months there has been some pain. The main
cause however for seeking relief is the actual mechanical inter
ference with function on account of the mass of the growth

On inspection you will note the presence of a large tumor on
the dorsum of the left foot over the distal ends of the metatarsals
(Fig 667)

DR. BROOKS   Examine this tumor and enumerate its most
significant characteristics.

STUDENT ( ) There are no visible changes in the skin over
lying the tumor ( ) there is no tenderness (3) the tumor pulsates
with definite expansile pulsations (4) there is no palpable thrill
(5) there is no murmur to be heard.

DR. BROOKS   With these characteristics, enumerate the
possiblities of the nature of this tumor

STUDENT (1) Aneurysm (2) a very vascular neoplasm.

DR. BROOKS   Assuming the condition here is an aneurysm
or a very vascular new growth, what evidences are there for and
against each of these possibilities?

Fig. 667—Photograph of Case II showing the position and size of he aneurysmal tumor

STUDENT I think it an aneurysm because the pulsation is
f the expansile type.

DR. BROOKS   The pulsation in an aneurysm is of th ex
pansile type, but so is the pulsation in very ascular tumor of
the expansile type. Pulsation in all directions is not charac
teristic of an aneurysm. It is characteristic of any tumor in
which the pulsation is within the tumor and serves t dis-

tinguish 'intrinsic' pulsation of a tumor from transmitted pulsation by a tumor from an underlying pulsating vessel

Furthermore, there are two facts which are against this tumor being an aneurysm First It is in a site at which aneurysm has not, to my knowledge, been previously observed. Second It is very difficult to think of an aneurysm of this size and this amount of pulsation without a thrill or a murmur

In spite of these facts which are, it seems to me very strongly against aneurysm I shall bring out a previous observation which beyond all question of doubt, proves this to be an aneurysm or at least a tumor composed of large blood spaces.

DR. BROOKS TO STUDENT (A) Find the posterior tibial artery with your right hand and the dorsalis pedis artery with your left hand

DR. BROOKS TO STUDENT (B) Palpate the tumor and tell us what changes you will note

DR. BROOKS TO STUDENT (A) Compress the dorsalis pedis artery

STUDENT (B) The pulsation in the tumor is decreased, but still present.

DR. BROOKS TO STUDENT (A) Keep the pressure on the dorsalis pedis artery and compress the posterior tibial artery

STUDENT (B) The pulsation in the tumor has completely stopped and the tumor is not so hard.

DR. BROOKS TO STUDENT (A) With the palm of the hand exert pressure on the tumor

DR. BROOKS You will note that pressure on the tumor is causing it to become smaller As the pressure is continued the tumor completely collapses.

DR. BROOKS TO STUDENT (B) Now remove all pressure from the tumor

DR. BROOKS You now see in place of the tense, pulsating, protruding tumor a depression with the characteristics of a collapsed bag (Fig 668) Now if the pressure on either or both anterior and posterior tibial arteries is removed, the tumor resumes its original characteristics. You will note that the tumor fills slowly and with a stethoscope over the tumor you can hear

a blowing murmur with each pulse wave while the tumor is filling

This examination proves that this mass is composed of a cavity in direct communication with both anterior and posterior tibial vessels. The vessel which is most likely involved, therefore is the branch of the dorsalis pedis artery which passes be-

Fig. 668.—Dra ing of Case II show ng the appearance of the aneurysmal tumor after compression of anterior and posterior tibial arteries and empty ng of aneurysm by pressure on the tumor

tween the first and second metatarsals to connect with the plantar artery to complete the plantar arch. That this artery is the one invol ed is also made most likely by the x-ray photograph of the foot (Fig. 669) which shows the separation and erosion of the first and second metatarsal bones.

This aneurysm, t seems to me, is unique in that it may be

considered a terminal aneurysm " The fact that it developed immediately after an injury makes it almost certain that this
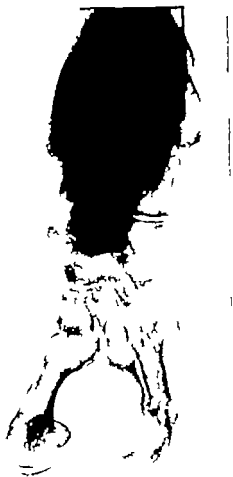
Fig 669 — Ray photograph of the bones of the foot of Case II showing the separation and erosion of the first and second metatarsal bones.

aneurysm is a false aneurysm *i e* that the aneurysmal *sac* is not derived from the vessel but is developed by the tissues

surrounding the open wound in the vessel. Such aneurysm sacs have no branches arising from the wall of the aneurysm. Furthermore the artery from which this aneurysm arises has no branches, as it is merely a communicating channel.
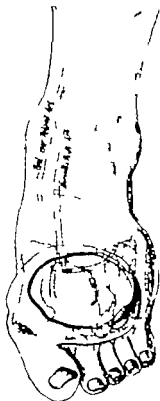
Fig 670—Drawing illustrating the findings at operation of Case II

It is, therefore true in this case that the aneurysm is not useful part f the circulation The blood which passes into the sac does not pass on through to supply some area with arterial blood Furthermore the artery from which it arises could be

completely occluded without interfering with any nutrient vessel. In fact is it not a matter of some considerable interest to wonder how it is that the "arterial arches of the hands and feet persist under normal conditions for there must always be some point in the arch at which there is no flow of blood.

With these facts therefore in mind the treatment of this aneurysm becomes merely a problem of complete obliteration of the aneurysm, to which may be added without fear of a disturbance in circulation the complete obliteration of the vessel from which the aneurysm is derived

In conclusion it would seem a matter of considerable interest to think how it is this aneurysm has not undergone spontaneous cure. The blood, in all probability does not "circulate through the sac. It merely passes in and out through the same opening From our observations on the emptying of the sac and allowing it to refill it would seem that the opening communicating between artery and aneurysm must be rather small If these conclusions are correct then the blood in this sac must be similar to "back water" from a flowing river One would expect under such conditions the clotting of the blood and the organization of the clot and the spontaneous cure of the aneurysm From the history we have definite evidence of the sac having been several times hard but, strange to say the clotting in the sac at these times failed to obliterate the aneurysm permanently

Note—This patient was subsequently operated and the condition found is shown in Fig 670 The aneurysm sac was formed by fibrous tissue and the eroded metatarsal bones. The sac communicated with the artery through a small hole. The artery was ligated on each side of the hole and the fibrous wall of the sac was excised No other openings in the sac were present The patient made an uneventful recovery and there was no evidence of any circulatory disturbance following operation.

CONTRIBUTION BY DR. ROLAND HILL

BETHESDA HOSPITAL

CONGENITAL PYLORIC STENOSIS

CONGENITAL pyloric stenosis is a condition found in early infancy The occurrence of this condition is not uncommon being present in approximately 1 in 200 babies as we have noted at the Bethesda Hospital and Foundling Home. It is characterised by persistent vomiting constipation, wasting, marked visible peristalsis, and frequently there is a palpable tumor present. The nature of the causative factor in this condition is a very mooted question. Different theories have been advanced. Scudder Downes, Richter,[3] Holt,[4] Stiles, and many others with a wide and varied experience have written exhaustively upon the subject.

It has been shown that the lesion in hypertrophic pyloric stenosis is a hyperplasia of the unstriped muscle-cells of the circular layer while connective tissue is not increased. The serous and mucosa are not involved except as affected by the hypertrophied muscle. Whether the hyperplasia of the circular band of smooth muscles of the pylorus is a congenital anomaly or whether the enlargement of this muscular band is a hypertrophy resulting from hyperactivity seems as yet undecided.

There are at least two different classes of cases referred to under the same name One, simple spasm of the pylorus associated with some hypertrophy of the pyloric ring the other in which the spasm and hypertrophy are associated with a true hyperplasia of the circular muscle fibers of the pylorus, and other cases varying in all degrees between these two

By some the condition is considered a primary hypertrophy with a secondary spasmodic element added. By others, as a

purely spasmodic condition from gastric or duodenal irritation. By still others the spasmodic condition is regarded as primary with the hypertrophy developing subsequently

In reviewing the cases of 54 infants which I have operated upon for symptoms justifying a diagnosis of pyloric hypertrophic stenosis it is noted that there have been two distinct types of cases (A) Those having an early onset of the symptoms, with an average age of seven weeks in which the marked tumefaction and true hyperplasia were present (B) Those showing symptoms and signs of stenosis with the exception of a palpable tumor In these no real hyperplasia existed However there was a noticeable hypertrophy present, and after incision of the smooth muscle sphincter of the pylorus prompt recovery without recurrence of symptoms was the rule.

Holt mentions the multiplicity of names f r this condition, and it would seem that there are two conditions with the same group of symptoms those of the one type being due to a true hyperplasia and the second or smaller group caused by a hyper spasticity or pylorospasm.

Sixty-one per cent. of my cases were of the former group and 39 per cent were of the latter type. In those cases in which the obstruction seemed to be due to pylorospasm there is usually delayed onset of symptoms and the loss of weight is less rapid, due to the fact that some chyme passes through the pylorus. These are the cases that respond most readily to medical treatment—i e tube feeding and gastric la age. It is my opinion that a true hypertrophy however slight is the underlying factor in every case. Taken collectively as to sex, these cases were 32 per cent females and 68 per cent. males, the youngest child was five days old the oldest, eight months. The onset of this condition is rather sudden thr child may be perfectly normal and become seriously ill in a very short time

Symptoms.—The manifestations of this disease may be considered under four distinct heads Vomiting constipation, visible waves of gastric peristalsis, and palpable tumor The first symptom that will attract attention is vomiting This may be slight at the onset but soon becomes decidedly aggra

vated. This vomiting is distinctly projectile. The propulsive force is at times so great that a child lying on its side may eject the contents of the stomach for a distance of several feet. Vomiting does not always occur immediately after taking food but in the later stages of a severe case a part or all of the food is ejected after each feeding. There is no fever unless complications arise, such as a late enteritis. The child loses weight rapidly. Constipation is most marked and in severe cases may be practically absolute. Mucus alone may be in the stools. The urine is scanty and dark in color. The face becomes wrinkled, the tongue and mouth dry, and the child is in a condition of marasmus. The upper part of the abdomen will be found on inspection to be somewhat enlarged, the lower part narrow and empty. At times the outline of the stomach may be seen reaching to the umbilicus. The waves of gastric peristalsis soon appear and are pathognomonic. The waves are due to the contraction of the gastric muscle. They show as a rounded eminence arising at the left costochondral border where it remains for a short time, then the wave passes across the abdomen and disappears on the right side. Occasionally multiple waves may be seen at one time. They are rarely more than 1 inch in height. These waves usually occur after food is taken.

The pyloric tumor can usually be palpated in this disease. It occurs as a smooth, rounded mass about the size of the end of the thumb lying at the site of the pylorus. The symptoms mentioned together with the presence of the tumor make the diagnosis positive. Occasionally a coexisting enteritis may tend to obscure the diagnosis. In one of my cases a meningitis resulting from an abscess in the ear proved to be very confusing. As an aid to diagnosis the use of the stomach-tube a couple of hours after taking food is of great value. At times all the feeding may be recovered.

Diagnosis.—The diagnosis is very clear in a well-marked case. The points that may be especially emphasized are (1) Vomiting. This eventually becomes projectile, and in a severe case practically nothing is retained. If the case is one in which

the vomiting is delayed, by the insertion of a stomach-tube
one may recover the entire feeding after two hours have passed.
(2) The gastric waves that pass from the cardiac to the pyloric
part of the stomach are characteristic. (3) The presence of a
tumor This can often be distinctly felt just below the margin
of the ribs on the right side. In 60 per cent. of the cases which
disclosed the true hyperplasia of the circular muscle-fibers
of the pylorus, tumor was palpable before the operation. In
40 per cent., having more or less distinct tumefaction revealed
at operation, the tumor was not previously palpable.

Downes' suggests that just before the abdomen is palpated
the stomach should be emptied of gas by passing a small catheter
and that the abdominal muscles be relaxed by allowing the baby
to suck water from a bottle during the manipulation. Or, if
necessary give a few whiffs of chloroform or ethyl chlorid to
secure the necessary relaxation. Certainly the finding of the
tumor is one of the most significant points in establishing a
diagnosis of the true hyperplastic type

The use of the flouroscope is very seldom resorted to and,
as a rule, the diagnosis is easily possible without its aid.

Treatment.—Holt' states that if a patient is observed from
the onset of the symptoms, or if a reliable history can be obtained
as to the duration of the symptoms, medical treatment is justified
for a period of from seven to ten days. provided the baby does
not lose more than 20 per cent. of its body weight during this
time. If, t the end of this period, the weight has become
stationary and there is a general improvement in the other
symptoms, this form of treatment may be continued always
bearing in mind, however that even though the infant seems
to be making satisfactory progress there may be a sudden
relapse. If so the case should then be considered surgical,
and operation advised If, on the other hand, there is no im-
provement under medical care or if the improvement is un-
satisfactory in that the baby is better one day and worse the
next, so that t the end of from a week to ten days the sum
total is that the baby is worse, the case belongs to the same
group and immediate operation is indicated

Downes[2] and others place the mortality of this condition under medical treatment at from 10 to 50 per cent. while the mortality by operative procedure in selected cases is a fraction under 2 per cent. Certainly when a child is losing rapidly operation should not be delayed

Operation.— In the well-marked cases surgical treatment alone offers a probability of relief or cure, and for this pyloro tomy gastro-enterostomy pyloroplasty and pylorodiosis have been performed in different cases.

Pylorectomy is an unnecessarily severe procedure and not to be recommended.

Pylorodiosis, or stretching the pylorus, or Loreta's operation has been used with fair immediate results, but cases are recorded where subsequent gastro-enterostomy was necessary

Pyloroplasty has been extensively practised by Nicoll. He made a V incision through the serous and muscular coats, closing this as a Y with a single row of sutures. In later cases he cut through all the coats, closing with two rows of sutures with good results.

Gastro-enterostomy was the operation of choice by most surgeons up to within quite recent years. The mortality is rather high but as many of the cases are almost moribund at the time of the operation, it can hardly be blamed for fatalities.

Formerly I did gastro-enterostomy The babies who were brought in early were in fairly good shape and recovered. Then more cases were being brought in many of whom were practically dead, and we lost quite a number I did 14 of these operations, with only 6 recoveries.

One child, a premature baby weighed 3 pounds and 15 ounces, upon which I did a gastro-enterostomy The baby recovered and is well today although nine years have passed.

At the present time I am doing the Rammstedt operation exclusively having used this method in 40 cases, with only 4 deaths—a mortality of only 10 per cent. in cases varying in severity from the ones of short duration and in good general condition to those with well-developed symptoms of enteritis. There was no death in any uncomplicated case.

In 1912 Rammstedt reported the successful application in 2 cases of partial plastic operation on the pylorus without opening the mucosa. The serosa and the thick muscular ring were incised without disturbing the mucosa. The muscular ring was found closely contracted, bloodless and, when divided, gaped at once sufficient to correct the tendency to stenosis, thus widening the lumen sufficiently for the desired purpose. To make sure of this, however Rammstedt sutured the incision in the first case, drawing the lips transversely and suturing a wisp of omentum over the whole to protect the line of suture beneath. The child vomited occasionally afterward and was a long time convalescing.

In the other case he refrained from the transverse suturing, being convinced that the slitting of the muscular ring answers the purpose fully

If the slit pylorus is left a little incontinent this can be regarded as an advantage rather than the reverse. The second infant was completely relieved of all disturbances and never vomited after the operation, but rapidly recuperated under appropriate dieting

In doing the Rammstedt operation I make an incision approximately 1½ to 2 inches in length through the right rectus, beginning 1 inch below the rib margin. A finger is introduced through the opening and the pyloric mass is easily exposed, sweeping outward from the stomach side. I have had difficulty in exposing the mass in only 2 or 3 cases due to the presence of adventitious bands or adhesions

The tumor when exposed may be found to vary in diameter from the tip of the little finger to the size of the ball of a man's thumb

A longitudinal incision is made through the serosa, beginning well down to the duodenum and extending over the pylorus, and well up on the stomach exposing the hypertrophied circular muscle. This band is now incised part way through and is separated completely by blunt dissection. This *latter step* is very easily accomplished and is a very important safeguard against the danger of puncturing the mucosa, an accident

which I experienced in one case. There is particular danger of tearing through the duodenum which is very thin in these infants. The stomach itself is usually dilated and the musculature near the pylorus hypertrophied

The circular muscle layer of the pylorus may be found hypertrophied from two to six times the normal thickness. On separating this band the mucosa is found puckered into a series of folds and can be stretched with the fingers pressing apart from either side of the incision. The tendency is not to stretch the pylorus sufficiently and not to make the incision of sufficient length I have had to reopen one of my cases on this account. In doing this a second incision was made along side the original wound and the child recovered without further trouble.

A point which I have never seen described is that of whipping over the cut ends of the muscular band separately with a running suture of very fine catgut This obviates the danger of hemorrhage from the pylorus, which has been quoted as the cause of a fatal result in 3 instances in the literature on this subject. There have been no deaths in my series due to hemorrhage, and I attribute this fact to the observance of this precaution

The serosa is not sutured, neither do I mattress a tag of omentum over the raw surface, although in one case obstructive symptoms developed on the sixth postoperative day and the abdomen was reopened and peritoneal adhesions were found These were released and the child recovered The abdomen is closed in layers.

Wallstein[1] recently reported the results in 25 postmortem examinations of cases which have been affected with this condition but several died from other causes. In 23 of these cases this operation had been done 2 cases died before operation. The ages varied from four weeks to two years. In her report Wallstein says that "the stomachs with hypertrophied pylorus when observed soon after operation, were dilated and often twice the size f a normal stomach of the same age. The thickening of the pylorus was due to an increase in the width of the circular muscle coat, the other layers showing no change.

"After the operation of incising this hypertrophied muscular band healing is brought about by the cells of the serosa and submucosa but the unstriped muscle-cells take no part in the process as evidenced by the absence of division among the cells. The raw cut muscle edges and the exposed layer of submucosa which protrudes into the gap between them become covered by a thin layer of delicate granulation tissue. By the contraction of this layer of fibrous connective tissue and the relaxation of the unstriped muscle the edges of the wound are gradually brought into contact and the pylorus relaxes. In from nine to thirteen days after operation the wound has completely healed, though the site of the operation still shows a very evident depression. In twenty-five days this depression has become less, and in six weeks only a delicate scar remains. In sixteen months a very thin linear scar is present. In two years the scar is scarcely visible and the stomach is quite normal. In contrast to the gastro-enterostomy this operation cures the pyloric lesion.

Postoperative Care.—Most of my cases of pyloric stenosis have been operated on at the Bethesda Hospital, where I have had the co-operation of nurses trained in handling young babies. This has been a very great aid in after-treatment.

These children should be fed on mother's milk as they do so very much better than with some of the prepared foods or modified milk. The improvement after operation is very rapid and a child today that is crying and vomiting all nourishment, that is the picture of marasmus, may within a week present a condition of rapid convalescence and contentment.

We saved one very sick baby by injection of glucose solution into the superior longitudinal sinus. We have found this to be of value in some of these very bad cases

The postoperative vomiting can be greatly lessened by giving small feedings frequently as the duodenum is atrophied in these cases from disuse and is not accustomed to receiving much chyme at a time, and it must be gradually trained to this after operation. For this reason and the injury from inanition it is best not to defer the operation too long

The postoperative shock is less than might be expected

depending more or less upon the condition of the child before operation.

Hemorrhage and peritonitis are risks to be reckoned with. The former is practically obliterated by suturing over the cut end of the circular band of muscle the latter by due care in approaching the mucous layer by blunt dissection

We do not favor local anesthesia, and consider ether the anesthesia of choice.

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CLINIC OF DR GEORGE GELLHORN

Barnard Free Skin and Cancer Hospital

HYSTEROMYOMECTOMY OPERATION FOR UMBILICAL HERNIA. SPINAL ANESTHESIA

The great distention of the abdomen in the patient before you (Fig 671) is due to a gigantic fibroid which is complicated by a large umbilical hernia. The indication for operation is clear but the patient has a loud murmur at the apex, a systolic blood-pressure of 154 and albumin and casts in her urine From the nature of the case the operation is bound to be very extensive and the question arises whether we can conscientiously subject to a prolonged ether narcosis a person whose vital organs are impaired without incurring an almost prohibitive surgical risk Fortunately we may resort to spinal anesthesia, which, in cases of this kind is far preferable to inhalation narcosis, as it puts no extra strain on heart, lungs, or kidneys, and yet permits the painless removal of even the largest abdominal tumors.

The technic of spinal anesthesia is not very difficult to acquire but demands attention to the minutest details for reasons which will be mentioned presently The instrumentarium (Fig 672) consists of a syringe of 10 c.c. capacity and a lumbar puncture needle with not too pointed a tip These have been sterilized and before use are rinsed out with sterile distilled water from the small bowl. The substances used for spinal anesthesia are stovain, novocain, and tropococain. I prefer novocain which is marketed in tablets each containing novocain 0 05 gr and suprarenin 0.00083 gr One tablet dissolved in 1 c c of water gives a 5 per cent. solution, 3 c.c. of this solution are needed In order to allow for evaporation and wastage four tablets are put in 4 c.c. of distilled water in this

celved an hour ago She folds her arms across her chest and
bends her head forward the legs are kept straight on the table
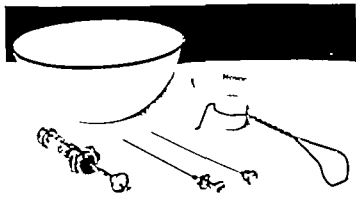
Fig 672.—Sterilized tray ith implements for spinal anesthesia. The
small bowl contains sterile distilled ter Note the porcelain dish in which
the novocain solution is boiled
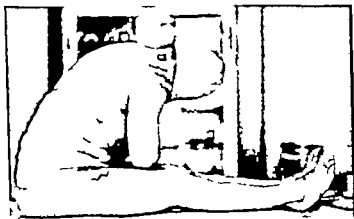
Fig. 673 —I this posture he difficulty of locating the xact site for spinal
anesthesia is largely eliminated

(Fig. 673) We remove the sterile covering from the back,
which has previously been cleansed. The injection is to be

little porcelain dish (Fig. 672) which has previously been
sterilized, and the water is brought to the boiling-point over an
alcohol lamp. If boiled too long the solution becomes reddish
and is apt to be less efficacious. In every strong individuals
I use a trifle more than 3 c c.

Fig. 671.—The enormous enlargement of the abdomen is due to gigantic
fibroid and an extreme umbilical hernia.

Meanwhile the patient has been asked to sit up upon the
operating table. She has had a good night's rest from dose
of eronal and she feels rather sleepy and indifferent because of
the hypodermic injection of morphin and atropin which she re

veins, until it meets with a second more elastic resistance, the wall of the arachnoidal sac. The stylet is now withdrawn the needle is very cautiously moved inward and perforates the wall of the arachnoidal sac without difficulty (Fig 675)

Let us recall for a moment the topography of the lumbar spine. The solid termination of the spinal cord lies at the lower border of the first lumbar vertebra in women and children usually a little lower down. From this solid end there spring two bundles of nerve-cords which, from their somewhat wavy

Fig. 675.—The needle is pushed through the skin immediately beneath the second or third spinous process and passed on in forward and very slight upward direction   By resting three fingers of each hand on the skin the progress of the needle through the various tissues can easily be felt and controlled

course, bear a faint resemblance to a horse's tail and hence are called *cauda equina*   The bundles of the cauda equina diverge slightly (Fig 676) leaving a small triangular space free, which is filled with spinal fluid and this is the space which we wish to enter   If the needle has been kept exactly in the median line the clear spinal fluid will trickle or flow freely from the needle as soon as it has arrived at its destination (Fig 677) and there will be no pain. If however the point of the needle has deviated a sharp pain lancinating into one leg or the other indi-

made in the second or third intervertebral space. In order to find the desired spot the patient is instructed to bend her body forward as far as possible, thus arching her back, and a sterile towel is held between the crests of the hip bones the edge of the towel crosses the spinous process of the fourth lumbar vertebra (Fig 674) It is now an easy matter to palpate the spinous

Fig 674.—The edge of towel spread between the crests of the iliac bones crosses the spinous process of the fourth lumbar vertebra. One of the next higher intervertebral spaces is selected for the injection.

processes of the third and second vertebrae unless the patient is very fat. The puncture is made in the midline and *immediately* beneath the spinous process. The needle is thrust with some force through the skin and the thick interspinous ligament underneath. After this resistance is overcome the needle is pushed in a forward and *very slightly* upward direction through a space, the *recessus ligamenti flavi* which is filled with fat and

veins, until it meets with a second, more elastic resistance the wall of the arachnoidal sac. The stylet is now withdrawn the needle is very cautiously moved inward and perforates the wall of the arachnoidal sac without difficulty (Fig 675)

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cates that a nerve-fiber of one of the bundles has been pierc

The needle should then be withdrawn a very short distance a

pushed in again, this time exactly in the midline. If the escapi

fluid is bloody the needle must be pulled out altogether and r

Ligamentum Flavum

Recessus Ligamenti Flav
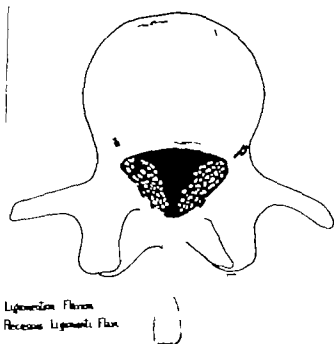
Fig. 676.—Diagrammatic cross-section of the spinal column at the level of the second or third intervertebral space. The bundles of the cauda equina (in ergo slightly less fing) free space which is filled xk the cerebro-spinal liquor. The slight resistance offered by the arachnoidal sac is plainly felt of the needle is guided in the manner shown in Fig 675

inserted in another intervertebral space. If the needle strikes the bone, either the back was not arched enough or the needle not inserted directly beneath the spinous process reinsertion may then become necessary

After a small amount of spinal fluid has escaped the syringe,

containing 3 c.c. of the novocain solution is snugly attached to
the *needle* and by drawing up 5 or 6 c.c. of spinal fluid the novo-
cain solution is thoroughly mixed and diluted and then *very
slowly* reinjected by a corkscrew like twist of the piston (Fig 678)
The injection finished, the needle is pulled out, and the small
puncture hole in the skin closed with cotton and collodium if
there is any seepage. The patient *remains sitting* but no longer
bent forward, for five more minutes, and is then laid down
slowly The object of waiting is this The greater portion of the
novocain is absorbed and held fast by the nerves of the cauda
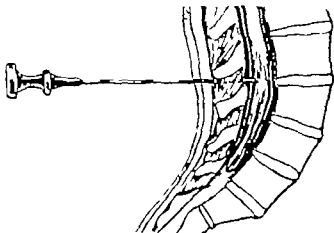
Fig. 677 —The needle is in   (Redra   from Liepmann.)

equina in the immediate vicinity f the injection. What is left
of the novocain diffuses into the spinal fluid and when it finally
reaches the *medulla* it is too diluted to do any harm or paralyze
the breathing center

The whole procedure has been quite painless, as you have
noticed Occasionally a very sensitive patient may complain
of the prick of the needle in the skin and there is no objection
to infiltrating the site of the injection with a drop or two of a
¼ per cent novocain solution

The first effect of the injection is numbness of the legs, which

is soon followed by inability to move them. This is often the only effect noticeable. The pulse remains regular and strong. There are, however, cases where a very marked and sudden lowering of the blood-pressure occurs. In former years instances of collapse were not infrequent. Painstaking attention to details, prevention of unnecessary loss of spinal fluid, slow injection of the diluted novocain solution, etc. have rendered complications following injection decidedly less frequent. It is largely a matter

Fig 678 The plunger ha ing been removed just before the needle perforates the arachnoidal sac and the spinal fluid escapes, the syringe this the solution is snugly attached to the needle and 3 or 4 of the spinal fluid are drn   np The solution, thus diluted, is ery slowly injected by t loting the piston

of practice, and one and the same person should always perform the injection. I prefer to do it myself In the large German clinics a special assistant is detailed to do this work E en with all possible care it is idle to deny that the sudden drop in blood pressure is always preventable It is therefore essential to keep an assistant on watch so that a hypodermic injection of 5 drops of adrenalin may be given should the pulse become weak or the patient faint Nausea with or without vomiting is of fairly common occurrence but, as a rule passes off quickly

After five minutes in the sitting posture we lay the patient down *slowly* but put several pillows under her head, so that the cervical spine is bent forward. The patient is now ready for the final preparation of the field of operation this being done, the foot end of the table is raised and the operation can begin about fifteen minutes after the injection has been made.

After the incision has been made two noteworthy features at once become apparent The abdominal walls are more fully relaxed than with any other method of surgical anesthesia so that retractors are employed with much greater ease and the abdominal parietes escape a good deal of bruising Then, too, the intestines remain quietly within the peritoneal cavity—the French have coined the term abdominal silence for this behavior this prevents brusque handling of the viscera frequently obviates the use of packs, and generally renders operative manipulations easier All this tends to lessen the operative shock, and as nerve impulses do not reach the brain spinal anesthesia is the ideal measure of shock association. You may have been surprised at the calmness and lack of interest on the part of the patient. If the case has been properly selected according to the principles which I shall propound presently no 'psychic shock' need be feared.

I have given the technic in great detail because the success and safety of spinal anesthesia depends on it to a great extent. To be sure, there is a certain percentage of failures in this as in any other method, but with growing experience these diminish steadily If occasionally a few whiffs of ether are required either in the very beginning or at the end of a tedious operation, I see no special disadvantage in t on the contrary this very small amount of ether acts as a stimulant rather than a depressant. During its experimental stage, when technic and dosage were equally undetermined spinal anesthesia may have caused a good many fatalities. Today with a mortality of 0 1 per cent., it is probably no more dangerous than ether narcosis, but as long as there is any mortality spinal anesthesia should not be used in trivial operations where local analgesia would do as well. In its last analysis spinal anesthesia itself is a form of local

anesthesia. While in every inhalation narcosis the poison enters the circulation and produces undesirable toxic effects on the lungs heart, and kidneys, in spinal anesthesia the greater part of the poison is deposited around the site of injection, as I have mentioned before, and is thus rendered harmless. This is the reason why we may employ spinal anesthesia with advantage in this case in which there are demonstrable lesions of the heart and kidneys it is also the reason why patients with pulmonary troubles, with high blood-pressure or diabetes are particularly suitable subjects and it is a well-established experience that aged people stand a spinal anesthesia, when they are apt to succumb to the immediate or delayed effect of an ether narcosis. *Even in the absence of organic or systemic disturbances spinal anesthesia* reduces appreciably the risk in operations which are burdened with a high mortality such as operations for cancer or fibroids but I do not go as far as those who prefer spinal anesthesia to inhalation narcosis in *all* laparotomies because I firmly believe that any routine method ignores the right of the patient to individualization. There are, in fact, certain conditions in which spinal anesthesia is positively contraindicated. These are, briefly hypotension, diseases of the central nervous system, shock, sepsis and fevers of unknown origin. kyphoscoliosis and other anomalies of the spinal column or cord strong prejudice against the method neuropathic disposition, tendency to headaches, and suppurations or eruptions near the site of injection.

In the meantime the operation has progressed satisfactorily The tumor weighing 14 pounds has been removed by typical panhysterectomy and the umbilical hernia has been eliminated

As you see the patient has slept soundly for more than an hour and exhibits no signs of apprehension I have no objection to giving the patient sips of water or black coffee if she complains of thirst, and I often carry on a conversation with her while doing my work I may say here that the *after-treatment differs in no wise from the customary method* It is, however noteworthy that experienced nurses, without exception consider "spinal cases easier to take care of than etherized patients The general behavior of such patients is better the omitting is

more often absent nourishment is taken without difficulty by most patients a few hours after operation. I have had several patients with experience in both methods of anesthesia who upon a third occasion demanded another spinal anesthesia. The only drawback to spinal anesthesia, as I see it, is the occurrence of postoperative headaches in about 30 per cent. of the cases. The cause of this annoying symptom is still obscure and its course sometimes protracted for a week. Among my ward patients I have seen it much more rarely than in private patients. On the whole its frequency has decreased since adhering strictly to the technic demonstrated before you.

ENUCLEATION OF FIBROIDS. COVERING OF RAW
SURFACES UPON FUNDUS WITH PERITONEUM

WHILE in the first case uterus and adnexa were removed with
the tumor the next 3 patients are young women ranging in
age from twenty-eight to thirty four in whom only the fibroids
have been enucleated and the genital organs left behind so as
to preserve the menstrual function and enable them to bear

Fig 679 —Ha ing distinct capsule, the fibroid is easily shelled out. (From
"Operath Gynaekologe by Doederlen and kroenig.)

children The desirability of such conservatism need hardly be
justified. It goes without saying that only subserous and inter
stitial fibroids can be dealt with in this manner provided they
are not too numerous. The technic offers no particular diffi-
culties Fibroids have a so well-defined capsule that they are
easily shelled out (Fig 679) The danger comes from subsequent

hemorrhage and suppuration in the wound beds of the tumors, and it is, therefore, necessary to ligate every bleeding vessel and to carefully draw the wounds together with a fine running cat gut stitch in order to obliterate every dead space (Fig. 680) This being done, a subcutaneous injection of ergot should be given, and the uterus should be kept firmly contracted for several days by repeated doses of the same drug

After the operation the uterus bears one or more sutured wounds to which omentum or intestines might readily adhere.
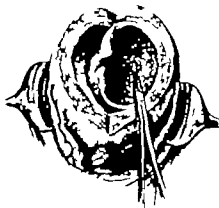
Fig 680—After the enucleation of fibroids it is essential to sew up the bed of the fibroid lth interrupted or continuous catgut so as to eliminate dead spaces (From "Operation Gynakologie, by Doederlein and Kroenig.)

In such a case untoward results are bound to follow A pulling sensation in the upper part of the abdomen gastro-intestinal disturbances of various degrees, and more or less ill-defined pains occur and even transitory ileus-like phenomena are not uncommon. On the part of the uterus the abnormal attachment of loops of intestine with a arying amount of distention leads to decreased mobility of this organ and in its further development, to menstrual disturbances. The continuous pull exerted by the structures above and behind may

eventually force the uterus backward and cause a fixed retro-flexion.

These unpleasant sequelæ of an otherwise useful operation can readily be prevented by adding to the enucleation a procedure
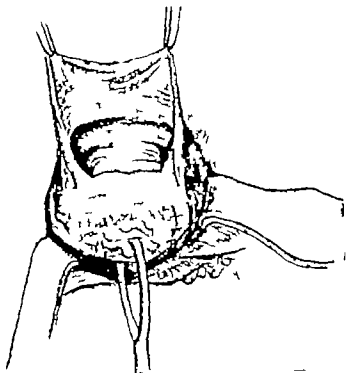
Fig. 681 — The bladder peritoneum has been pushed off the cervix and is held read be reflected across the fundus. Note the bladder in the depth of the wound

which I have described in detail some years ago (Amer Jour Obst and Gyn 1920 1, 262) The fundus is grasped by a tenaculum and pulled backward and upward in the direction of the promontory The reflection of the bladder peritoneum upon the cervix which now becomes plainly visible, is incised transversely as in hysterectomy and pushed off from the uterus (Fig. 681)

If this blunt dissection with the finger is gentle enough and
does not extend into the broad ligaments, the bleeding is usually
insignificant and is quickly checked by the pressure of a sponge.
The uterus is then tilted forward, the bladder peritoneum is
pulled over the uterus and stitched to the posterior aspect of
the fundus, where an intact peritoneal surface presents itself
(Fig 682) In small uteri the bladder peritoneum may be
fastened as far back as the insertion of the sacro-uterine liga-
ments, and in this connection it is often amazing to see how
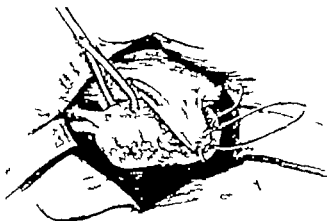
Fig. 682.—The apron of bladder peritoneum is being stitched to the posterior
aspect of the fundus

much the size of the uterus is reduced after one or more fibroids
have been enucleated and the uterine muscle contracts firmly
After the first few turns of this continuous catgut stitch the
tenaculum is removed and the stitching continued until the
entire fundus with its raw areas has disappeared beneath its
new peritoneal covering By using an inverted stitch even the
catgut knots become invisible. The newly formed covering
consists only of the bladder peritoneum which in many cases is
so thin and transparent that the suture lines and tenaculum
holes may be distinguished.

The question, Is the function of the bladder disturbed after this procedure? will at once suggest itself to you. In the eight or nine years that I have employed this method I have *never* observed instances of vesical disturbance other than those that may
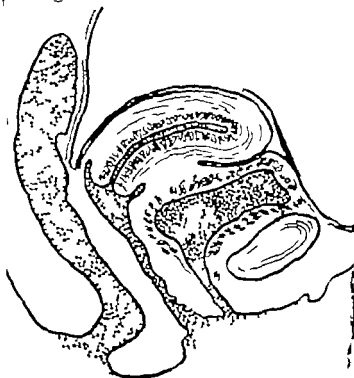
Fig. 643.—A diagrammatic view of the postoperative conditions show the relation of bladder and uterus unchanged Hence no probability of vesical disturbance.

follow any laparotomy A moment's visualization of the condition created will supply the theoretic explanation of the absence of postoperative complications. The relations of the uterus and bladder are not essentially altered. The uterus still lies on top of the bladder Only the peritoneum which at this

point is loosely connected with the bladder is stretched and pulled across the fundus (Fig 683) The bladder at the border of the posterior and upper walls may adhere to the uterus a little higher than usual, but still on its anterior aspect. Hence the filling of the bladder will cause neither subjective nor objective disturbances.

The same freedom of the bladder obtains in pregnancy when the gravid uterus may rise into the abdominal cavity without dislocating the bladder more than is the case normally I have in mind the case of a woman of thirty-one years, who, after several years of married life, consulted me on account of her sterility I found the uterus enlarged to the size of a man's fist by multiple fibroids and, on operation removed one intramural and four subserous fibroids ranging in size from that of a walnut to that of a moderately large apple. After the wound beds had been drawn together carefully the uterus, which now had attained normal size, was tucked beneath the bladder peritoneum in the manner just described. Eight months later the patient conceived and carried her child to a spontaneous full-term delivery without bladder symptoms of any kind.

On re-examining patients on whom this finishing touch has been done for which I propose the name 'vesicofixation,' the normal position and mobility of the uterus are pleasing findings to record. Parenthetically I may add that I have found frequent use for this procedure after operations for fixed retroflexion or tubo-ovarian tumor

TREATMENT OF FIBROIDS WITH RADIUM

In discussing the various methods of treatment for uterine fibroids we must bear in mind that an operation is required only in from 30 to 40 per cent. of the cases. The great majority can be cured by means of radium. Such a statement would have met with ridicule a few years ago Today it is an indisputable fact. It has been proved by thousands of cases that the hemorrhages can be checked with certainty and that from 70 to 80 per cent. of the tumors will shrink in size. The very small percentage of failures in the past has been due to injudicious employment of radiotherapy and can be avoided by a proper selection of the cases. It is, therefore, of prime importance to know when to operate and when to use radium In a very general way it may be said that women under forty should be operated upon in the hope of preserving the ovaries and, as far as possible the uterus In women over forty radiotherapy is the method of choice. Both these indications are subject to certain exceptions. Thus, in younger women, radiotherapy should be substituted for operation if there be any complication present that forbids or seriously handicaps surgical intervention likewise if the patient positively refuses operation. In women over forty on the other hand operation is indicated if the tumors are of excessive size, if they are of the pedunculated subserous or submucous variety or if they are complicated by any form of degeneration or associated with adnexal disease. This leaves in women of this age the cases with interstitial or sessile subserous fibroids—a category which as you perceive constitutes by far the majority of our fibroid cases.

The method of treatment is by intra-uterine application. The uterus is dilated during a short nitrous oxid-oxygen anesthesia or a morphin-scopalamin seminarcosis, and a curettage is performed to exclude y coexisting malignancy The radium contained in silver capsules or steel or gold needles and placed in tandem fashion within a tube of pure rubber is then introduced

well up into the uterine cavity   The rubber hose of a fountain pen is particularly well suited for this purpose (Fig 684)   The usual dosage is 1200 milligram hours—that is to say 100 mg radium are left within the uterus for twelve hours   It goes without saying that greatest aseptic care must be observed.   We disinfect the radium applicator by placing it first in pure carbolic acid and afterward in alcohol.

The intra-uterine radium treatment should be supplemented by a series of x ray treatments.

Just how the radium produces the desired effect is still open for discussion.   The prevailing view is this, that the radium rays destroy the graafian and primordial follicles and thus bring about an atrophy and loss of function of the ovaries.   The term
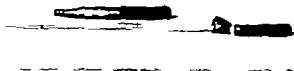
Fig. 684.—The "hose of fountain pen, being of pure rubber, protects the endometrium against secondary radiation from the metal capsule containing the radium.

"bloodless castration has been used to express this action of the radium   The artificial menopause thereby created leads not only to a cessation of the uterine bleeding, but affects the size of the tumors by a premature age involution

This explanation is undoubtedly true but it is not sufficient, and I have come to believe that in addition to the action upon the ovaries there is also a specific effect of the radium upon the tumor tissue.   A few observations made within the last year will prove my point.

A lady of sixty-eight was operated upon for fibroids more than thirty years ago   At that time hysteromyomectomy was generally considered too hazardous an operation and, therefore only the ovaries were removed with the result that there had

been no bleeding since. I do not know how large the tumor was at the time of the operation, but when I saw the patient thirty or more years later she *still* had a multinodular mass almost as large as a man's head in her abdomen. The artificial menopause, then, had not sufficed to materially reduce the size of the tumor.

Contrast with this the following 3 cases

A lady of forty-six was referred to me for myomectomy. The tumor reached to within 2 fingerbreadths of the umbilicus and consisted in the main of two growths of which one was interstitial, the other more subserous. The bleeding was abundant and persistent in spite of styptics, ice-bags, etc. The hemoglobin was 30 per cent. erythrocytes, 1,500,000 Shortness of breath and renal casts still further complicated the clinical picture. Contrary to the expressed preference of my consultant for operation, I employed the combined radium and x ray treatment, with the result that the hemorrhage ceased promptly the large tumor shrunk to little more than the size of a man's fist, and the patient recovered her health completely—all within the short time of four months. The diminution of the tumor continued, and when I last examined the patient, one year after the treatment, the uterus had returned to normal proportions.

The beneficial effect of radiotherapy was even more pronounced in the second case. The patient, forty-eight years old, suffered from excessive hemorrhages and presented the picture of so profound an anemia that operation was out of the question. The tumor was an interstitial fibroid and extended upward to within 2 fingerbreadths of the umbilicus. An intra-uterine treatment of 1200 mg of radium followed, within the next days, by two exposures to the x rays, not only checked the hemorrhages, but reduced the uterus to absolutely normal size *within thirty days*

An unmarried women of forty-six was assigned to my service in another hospital for the removal of a fibroid tumor extending 2 fingerbreadths above the umbilicus. While the size of the uterus demanded an operation, the general condition forbade surgical intervention, as the patient had chronic cardiac valvular disease arteriosclerosis, marked debility and a beginning

psychosis. This patient merely received an intra-uterine radium treatment, without any x rays, and the rapid shrinking of the tumor can best be demonstrated by a glance at the accompanying sketch (Fig. 685). Two months after the treatment, when the tumor had already lost about one-third of its original size, the patient had to be transferred to an insane asylum, and I have since lost sight of her
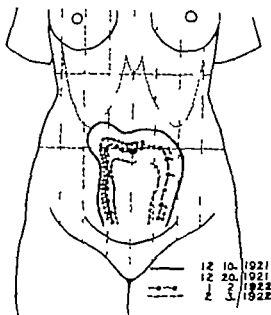
Fig. 685.—The outlines show the remarkable demarkation of the fibroid in the eight weeks following the radium treatment

The feature common to these 3 cases is this All 3 patients had large tumors. In all 3 the menstruation occurred once or twice after the treatment at regular intervals, but with a scant amount. The tumors, however, showed a decided shrinkage even before the menses stopped definitely. This proved t my mind that there is a specific effect of radiotherapy upon the tumor tissue in addition to the effect produced b the destruction of the ovarian function.

HEMATOMETRA DUE TO RADIUM

THE marvelous results accomplished with radium should not let us lose sight of the fact that radium is a mysterious agent of which, after all, we know very little. We are working with a force which does an enormous amount of good but may be productive of a great deal of harm. Fistulæ and more or less serious injuries to neighboring organs were the toll we had to pay for the crude empiricism which characterizes every new method, and even now that our eyes are open to the possibility of danger a word of caution is not out of place. Only within the last six months I had occasion to observe in 2 cases a complication which has hardly been mentioned in the literature on radium.

The first case concerns a childless woman of forty two years who had suffered all her life from intense dysmenorrhea. Medicinal and local treatments repeated dilatations, and curettages were of no avail and even the removal of one ovary gave her only a temporary relief. She now wanted the other ovary removed and I proposed to eliminate it bloodlessly by radium. Dilatation was extremely difficult on account of a fibrous stenosis of the internal os. Because of that the rubber tube with the radium may not have been pushed well beyond the constricted portion. At any rate, four weeks after her return to her home in a distant state she was seized with excruciating pain in the lower abdomen which not even morphin injections could fully relieve. After three weeks of intense suffering she returned to St. Louis. I found a uterine tumor about the size of a grapefruit, obviously a hematometra. The condition was only too clear. The burn which follows every intra-uterine radium application had led to a complete closure of the stenosed cervical canal and the one and only menstruation which she had after the treatment had filled the uterus with blood. It was a simple matter to dilate the atresia and to keep the canal open for a few weeks. The uterus now shrank rapidly there has been no return of the menstruation,

and from her letters I learn that for the first time in her adult life, she is enjoying undisturbed health.

The second case I can demonstrate to you today This patient came to the hospital in a deplorable state from an inoperable cancer of the cervix. She received a radium treatment of 2640 mg., 110 mg. radium being embedded in the cervical growth. There was a short initial improvement, but three weeks later she was taken with chills and fever and she noticed a painful swelling in her lower abdomen. Examination at that time revealed a tumor rising from the pelvic cavity as high as the umbilicus. Her temperature was 102.5° F she had a white count of 17 600 and the general condition seemed desolate. The diagnosis of pyometra was obvious. The cauliflower of the cervix had melted away after the radium treatment. In its stead there was now a mass of cicatricial tissue, and though I tried for quite a while I did not succeed in finding an entrance to the uterine cavity.

You will appreciate the difficulty of the situation. Hysterectomy was out of the question neither could I unduly prolong the narcosis in this cachectic and thoroughly toxic patient.

Under these circumstances I resorted t foreign protein therapy in the hope of improving the general condition of the patient and rendering the seemingly inevitable end somewhat easier This is not the place to speak in detail of the uses of foreign protein therapy in gynecology I have discussed these elsewhere (Journal Missouri State Med. Assoc. 1922, 19 341) It may suffice to say that proteins injected intramuscularly have the faculty of stimulating the cells of the body to greater protoplasmic activity This pertains in particular to those cells which have become weakened by bacterial invasion. Under favorable circumstances the affected cells may recover their natural powers of defense in other words, the protoplasm again develops phagocytic properties, the toxins are neutralized by a fresh production of ferments and antibodies, the local metabolism is intensified, and the pus is absorbed.

Of the various proteins recommended for this purpose, I ha e been employing milk with success for some time past Ac

cordingly sterilized milk in quantities ranging from 5 to 10 c.c. was injected at intervals of three days into the gluteal muscle. Much to our gratification the general condition improved almost from the beginning, the appearance and behavior of the patient approached that of a healthy person; pain and fever disappeared, and the uterine tumor decreased visibly in size. After seven injections the fundus was half-way between umbilicus and symphysis, and today that is to say about five weeks after the first treatment, the body of the uterus has returned to almost normal dimensions.

This surprising absorption of a cancerous pyometra which exceeded my keenest expectation is I believe a unique observation.

Addendum.—The improvement in this case lasted several weeks. The cervical cancer then began to grow again and rather rapidly led to the death of the patient.

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THE

SURGICAL CLINICS

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ternal rotation is not accomplished at all. The external rotation, you see is, in reality a pseudosupination. Apparently flexion and extension of the fingers and wrist are unimpaired, as are also the movements of the fingers. Thus we have seen the total movements which the patient can perform

The information thus gained may be of immense value providing you are familiar with each movement and the component muscles involved in each phase of any such total movement. However the only reliable motor information is gained not from total movements, but from a study of the action of *each individual muscle* The action of any one muscle may drop out, and yet a total movement may be performed either by the remaining muscles of the group or by the action of new muscular combinations. This Létiévant (1872) termed "mouvements suppléés." A great variety of such movements were described by him and of such movements we must be aware if we wish to place reliance upon the information given by total movements.

Individual Muscle Action.—We will now try out the motor function of each individual muscle of this extremity   We will begin with the deltoid. The patient is unable to elevate the arm in abduction more than is done by the action of the scapula which, in attempting to co-operate in the elevation of the arm undergoes rotation. This rotation of the scapula occurs as the initial movement in elevation of the humerus, and it is to this rotation of the scapula that the slight abduction of the humerus which you see here must be attributed. The patient is unable to elevate the humerus further and the hand palpating the deltoid finds it flat and flaccid without any appreciable trace of contraction

It is interesting to note in this connection that the usual text-book description of the action of the deltoid is not that which we now understand this muscle to have. In elevation of the humerus there are really two component cycles of movement (1) rotation of the scapula and (2) elevation of the humerus. We are taught that the deltoid elevates the humerus to a right angle, but this is not really the case. In elevation of

5 or 6 degrees. Following this, the deltoid elevates the humerus to about 60 degrees *and from 60 to 115 degrees elevation is accomplished principally by the action of the scapular muscles* following which elevation is completed to 180 degrees, that is, to the vertical position *by active participation of the deltoid* especially the clavicular head. This action of the deltoid in the elevation of the humerus from 115 to 180 degrees has heretofore been ignored although it is a very important part of its function.

We will now test adduction. As the patient attempts to draw the arm inward toward the body we offer resistance and at the same time palpate the tendons of the teres major and the pectoralis major These contract and appear to be normal. The patient now attempts to draw the arm inward and forward across the chest, thus testing further the action of the pectoralis major This movement is readily accomplished, and the pectoralis major you notice, is definitely contracted but if you are careful in your examination you will see that the clavicular head of this muscle does not participate—only the sternal portion is contracted, the clavicular being flaccid and apparently atrophic. *The clavicular head* of the pectoralis major is paralyzed.

We will now test the external rotators namely the supraspinatus and infraspinatus. Neither of these muscles contracts and no true external rotation takes place. We notice the hollow both above and below the spine of the scapula, which indicates their atrophy.

Next, we will test the biceps. Flexion of the forearm is impossible and as you see, this muscle belly remains flabby It is completely paralyzed, is atrophied and has lost its tone.

We will next test the supinator longus. This muscle is poorly named, for t is very little a supinator and very much a flexor of the forearm. If in a normal individual the forearm is held semiflexed and the patient is told to continue flexion, this muscle will rise as a distinct band, forming the lateral boundary of the elbow In this case no such muscular band is made out, and the semiflexed elbow is seen to be without its usual lateral boundary nor does any flexion take place. The supinator longus is paralyzed. I have seen excellent men fail t recognize a biceps

paralysis because the patient was able to flex the forearm sufficiently well upon the arm by means of the supinator longus without the loss of the biceps action being detected. This flexion action of the supinator longus must not be forgotten

Next we will try the triceps. Here extension of the forearm is performed but there is some obvious weakness particularly noted by comparison with the sound side. The coracobrachialis muscle can be made to contract and palpated by having the patient attempt to raise the arm into the gun position. While this position cannot be accomplished in this patient due to paralysis of other muscles. contraction of the coracobrachialis can be distinctly made out

In the forearm. The flexors of the wrist on both the radial and the ulnar side are distinctly felt especially are they made out over their tendons at the wrist where with some practice most of them may be fairly accurately identified. The flexor carpi ulnaris shows normal contraction, and the action of the palmaris longus is readily demonstrable

We note then, in summarizing our motor findings, paralysis of the following muscles. Deltoid clavicular head of the pectoralis major supraspinatus infraspinatus biceps, supinator longus, and weakness of the triceps.

Obviously such an extensive lesion cannot be explained by injury to any one peripheral nerve nor can it be attributed to a lesion of the secondary cords. The site of an injury involving such a distribution—including as it does muscles supplied by the suprascapular nerve, the external anterior thoracic, the musculocutaneous, the circumflex and *part* of the musculospiral—can only be accounted for by some injury to the brachial plexus proximal to the formation of the secondary cords. Injury to any peripheral nerve would involve only muscles in the distribution of that nerve. Injury to any of the secondary cords—unless nearly all are involved—would generally show a distribution corresponding to two or more nerves, while this distribution corresponds to five. Furthermore, a lesion of the secondary cords could not explain paralysis of the clavicular head of the pectoralis major or paralysis of the supra and infraspinatus, since the nerve

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We will next test the supinator longus. This muscle is poorly named, for it is very little a supinator and very much a flexor of the forearm. If in a normal individual the forearm is held semiflexed and the patient is told to continue flexion, this mus cle will rise as a distinct band forming the lateral boundary of the elbow In this case no such muscular band is made out, and the semiflexed elbow is seen to be without its usual lateral boundary nor does any flexion take place. The supinator longus is par alyzed. I have seen excellent men fail to recognize a *biceps*

told area. The outer line indicates the loss to cotton wool, while the inner and smaller area shows the loss to extreme degrees of temperature and to pin prick. The area you see outlined is the only one in which any anesthesia has been found. None was made out below the elbow corresponding to the sixth root distribution. This area you see does not correspond to the
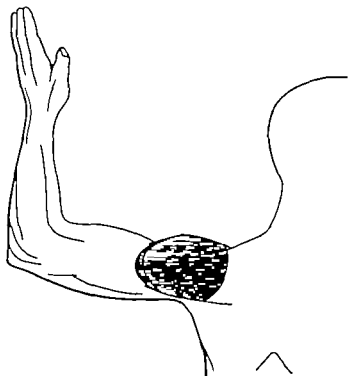
Fig 222 —Chart showing loss of sensation as found in Case I. This area corresponds approximately t the distribution of the fifth cervical root.

area supplied by the circumflex nerve, in that it is very much smaller than the usual cutaneous distribution of this nerve. The circumflex nerve arises from the posterior divisions of the fifth and sixth and contains sensory fibers from both, though mainly from the sixth. Since this area does not correspond to the circumflex, but more to the contribution in the circumflex

supply of these last two muscles comes off the brachial plexus before the formation of the primary outer cord, or *immediately at the junction of the fifth and sixth cervical roots.*

Thus considering the information given by the local examination *of the site of the injury* and the motor distribution of the paralysis, the lesion in this case must be placed in the fifth and sixth cervical nerve roots proximal *to the point,* or *at the point* at which the suprascapular nerve is given off. The lesion does not extend to the seventh root, since the coracobrachialis muscle is not paralyzed. This muscle, you will recall, is supplied by a separate nerve, the nerve to the coracobrachialis muscle, which arises from the seventh cervical and passes *along* the musculocutaneous nerve to the coracobrachialis the musculocutaneous nerve, on the other hand arises from the fifth and sixth cervical while the nerve to the coracobrachialis which accompanies it arises from the seventh cervical.

The lesion in this case however is not complete, that is, the anatomic continuity of the fifth and sixth roots has not been interrupted, since certain muscles completely or partially supplied, though not invariably through the fifth and sixth are not paralyzed nor is there any weakness in them. They are the palmara longus the flexor carpi radialis, and sometimes the superficial muscles of the thenar group.

Electric Examination.—This has already been made, and the report shows that there is no faradic response in the muscles which we have already designated as paralyzed. *There is no reaction of degeneration.*

This information confirms the motor examination. However it must be recalled that frequently a muscle which has regained *ts power of contraction following paralysis may not show a return of faradic irritability until long after return of vol untary motion.*

In spite of the information already gained, the examination of this case is not *complete* until a sensory investigation has been made. Here is the chart of the sensory changes found in this patient (Fig 222) There are two lines, an outer and an inner Both lie over the deltoid, but do not completely overlie the del-

through the scar As I dissect deeper the sixth cervical cord is
seen. I have my finger on it. The scar is at the union of the
fifth and sixth roots. I am dissecting laterally now to find the
suprascapular nerve so as to trace it inward through the scar
and thus avoid damaging it, as I might do if I hunted for it in
the scar Here is the suprascapular nerve. As I dissect it to its

Fig 223.—Right plexus brachialis with its short branches, viewed from in
front. The sternocleidomastoideus and trapezius muscles have been com-
pletely and the omohyoideus and subclavius muscles partially removed;
piece has been sawn out of the clavicle the pectorales muscles have been
incised and reflected (Spalteholtz)

origin it is seen involved in the scar I am now dissecting the
scar tissue from the nerve trunks. The fifth root is more involved
than the sixth. The fifth is somewhat contracted by the scar
though anatomic continuity is not broken. The suprascapular
nerve is more damaged than the fifth root, and the fifth more than
the sixth This is tedious dissection. Each stroke is most cau

of the fifth cervical root, we may infer that some fibers of the
sixth cervical root remain uninjured, especially since no changes
were found in the area belonging to the sixth root.

Thus the sensory findings substantiate the conclusion reached
in the motor examination namely that the lesion of the fifth
and sixth cervical roots is not complete and involves mainly the
fifth. Further evidence of the incompleteness of the lesion is
found in the referred pain which is elicited by pressure over the
scar. The patient outlines consistently an area of referred pain
which roughly corresponds to the sixth distribution. Referred
pain of this character is not found in complete nerve lesions.

Our diagnosis then, is an incomplete lesion of the brachial
plexus involving the fifth and sixth cervical roots, proximal to
or at the point at which the suprascapular nerve is given off.

Judging by our examination of the local injury it is only
fair to assume that the roots are involved in the deeper portion
of the scar which we here see superficially.

Operation.—A longitudinal incision 4 inches long is made
over the site of the injury. A longitudinal incision is made so
as to permit of a more extensive exposure of the plexus, if such
is called for. I am now excising the superficial scar so as to
exclude it from the line of closure. Scar tissue delays primary
union and is apt to slough. As I dissect further a small muscle
belly is seen running transversely across the field. This is the
posterior belly of the omohyoid. This muscle is now pulled
aside and the transverse cervical artery and vein are exposed.
We pass a ligature around each and cut both artery and vein.
I am now passing two sutures through the omohyoid and shall
cut between them. These sutures serve as hemostatic muscle
sutures, preventing bleeding from the cut muscle ends. The
muscle is now cut transversely and these two sutures will be
used to reunite the muscle when closing the wound. I can now
identify the scalenus anticus and scalenus medius muscles.
Between these the plexus should lie (Fig. 223).

As I clear away the fascia the upper cord presents. I am
working above the site of the injury. It is always better to isolate
the structures either above or below and then dissect down

order to relax the deltoid the forearm is slightly flexed and
held in external rotation, thus relaxing the biceps and supinator
longus and the arm is held in external rotation, overcoming the
tendency to contraction of the internal rotators. The arm will
be held essentially in this position until some evidence of re-
generation has shown itself.

We have done nerve liberation and not nerve suture. If no
improvement is shown within two months after nerve liberation,
this generally means that nerve suture should have been done
instead of liberation. However since there is no way of deter
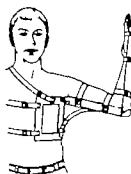
Fig 224—Adjustable abduction splint with adjustable forearm piece for
paralysis of the fifth and sixth cervical nerves. The arm is held in abduction
and external rotation with the hand in supination. By altering the pin and
lever to the arm-piece, the arm can be held in any desired angle f abduction.
Forearm piece may also be adjusted by screw lock to various degrees of flexion.
The splint is made of aluminum and lined with felt.

mining with certainty which should be done, we can only rely
upon our own judgment—the result of seeing a great many such
conditions—and, now that we know the condition of the nerves
wait two months for some evidence of regeneration. This can
be done without any great injury to the patient. If our judg
ment has been correct, we will have saved him a year since
regeneration following suture can hardly be expected in less
time. In the meanwhile we shall see that massage and galvanic
current are given, and that neither contractures nor overstretch-
ing of the paralyzed muscles occur

tiously done Speed is not an asset at such times. Care must be taken to injure as little as possible the nerve trunks must not be handled.

The scar is now free from both the ventral and lateral aspects of the fifth and sixth roots. We shall now test with the electrode. Slight response is obtained in the biceps none in the deltoid. With the patient lying on his back, it is difficult to determine if there is any response in the supra and infraspatii muscles. In view of the recent injury (two months old) and the anatomic picture we have here, it is best to be conservative. We will inject salt solution under pressure into the nerve trunk, thus freeing the individual funiculi. This is called internal neurolysis.

The field is cleared of scar as much as possible where we have not been able to excise, we have infolded it upon itself In some instances this is better than excision. Due to the localization of the injury namely in the neck, where in this man there is little or no fatty tissue to serve as a fat pedicle to transplant in order to wall off the scar we shall surround the nerve with Huber's cargile membrane. A free fatty transplant serves only to increase scar and should not be employed. Huber's membrane is ordinary Cargile treated with alcohol. Huber Professor of Anatomy at the University of Michigan, found that such membrane remains in the tissues five or six months without being absorbed, and that it is borne well by the tissues without causing any increase of scar whereas ordinary membrane is readily absorbed remaining in the tissues about as long as catgut. Huber's Cargile membrane, I believe, has a great field of usefulness not only in neurosurgery but in other fields as well.

Had I done nerve suture and thus removed the injured portion of the nerve, no form of protection at the line of union would be necessary The field is now dry—this is a very essential point—and we are now closing the wound in layers. Dressing is applied and we are now ready to put on the splint, which has already been made and fitted to the individual (Fig 224)

This splint aims to overcome the deformity which results from this injury The arm is abducted above a right angle in

It is well known that paralyzed muscles may not regain their contractility when they have been continuously over stretched even after nerve regeneration but may again recover their power after a prolonged period of rest and relaxation. In this case the aim has been to maintain this position—which you see here—constantly for six months, except when massage has been given, which has been done twice daily The arm has been put through a series of passive motions to prevent contracture and to exercise the muscles. This treatment has served to im-
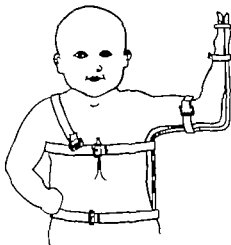
Fig 225.—Another splint for brachial plexus injuries of the Duchenne-Erb type. Note that the splint is carried down to the pelvis so as to have its main point of pressure there This splint may be made of aluminum. It is exceedingly light and simple.

prove the nutrition of the part the arm looks larger and is generally in better condition. The mother thinks there has been some improvement. However this is slight.

In this connection I should like to say that no brachial plexus injury should be allowed to go without mechanical treat ment designed as far as possible, so as to prevent contracture and overstretching of the paralyzed muscles. When such treat ment has not been given no operative intervention should be

Note.—The patient left the hospital in ten days. The wound healed by first intention. Four weeks after operation some evidence of regeneration was seen, and in four months function had returned in all the muscles except the supra and infra spinatii. A second operation will be done on the suprascapular nerve to try to obtain innervation of the external rotators.

CASE II.

This is an infant, two years old. Normal labor no instruments, head presentation. Since birth it has been unable to use its left arm. The fingers move and also the wrist, but flexion of the forearm or elevation of the arm is impossible. The child was seen by several physicians after birth, one of whom told the mother to do nothing and the other that the injury was to the shoulder joint and that the condition would gradually improve. After six months the mother took the child to one of the neighboring cities where, among other things done, an x-ray was taken, but nothing was found. The consultant advised her to wait and return again in six months. The mother brought the child to me six months ago; that is, when both the child and the injury were eighteen months old.

Examination of the child at that time showed a typical Duchenne-Erb palsy the arm being limp at the side, with inability to raise it in either the horizontal or frontal plane. The whole arm and forearm were turned inward, and the palm faced backward and outward. This position is characteristic of the Duchenne-Erb palsy. Slight subluxation of the shoulder joint was present. x Ray of the shoulder showed nothing abnormal, except that the coracoid process seemed larger and curled downward. Stereoscopic examination showed subluxation with the head drawn backward.

The mother at the time was desperate and insisted that something definite be done. In view of the fact that the paralyzed muscles had always been overstretched and had never been relaxed by any mechanical treatment, the arm was put up in a splint similar to the one which you have seen in the previous case (Fig. 225).

fingers are seen moving in flexion and extension. The wrist is
slightly adducted and the forearm is rotated inward, as is also
the humerus. The palm of the hand is turned backward. The
child is unable to raise the arm or to flex the forearm. If the
forearm is flexed it is unable to extend it. There is marked
atrophy of the deltoid biceps, and supinator longus and there
is some atrophy of the radial flexors, though it is not possible to
determine precisely which muscles are involved. In an infant it
is almost impossible to examine the individual muscular action
the information on the motor side must be gained by prolonged
and repeated observation of the movements performed. The
sensory examination is also of little value. For accurate sensory
examination co-operation of the patient is essential. Obviously
this is impossible in an infant.

The electric examination shows no faradic response in the
deltoid, biceps or supinator longus. The examiner reports that
further electric examination was impossible, since he was un-
able to determine with accuracy the response in the smaller
muscles.

Analysis of this case shows then the following Paralysis
of the deltoid supra and infraspinatus biceps, and supinator
longus, with some weakness probably of the radial flexors of the
wrist and fingers. Such a lesion can only be accounted for by
injury of the fifth and sixth cervical roots above the clavicle.

The seventh is not involved, since there seems to be little
weakness of extension. The eighth cervical and first thoracic
are not implicated since the movements of the fingers and the
shape of the hand show no paralysis or atrophy Further evi-
dence that the first thoracic and eighth cervical are not involved
is seen in the fact that the cervical sympathetic is unimpaired,
since the pupils are equal and there is no sinking in of the eye-
ball on the affected side. The fibers of the cervical sympathetic
enter the cord through the first thoracic, sometimes the eighth
cervical or second thoracic roots, so that when these roots are
torn interruption of the cervical sympathetic fibers occurs.
When this takes place there is a sinking in of the eyeball—
enophthalmos—due to paralysis of Müller's muscle, with sec

undertaken until an opportunity has been afforded the over stretched muscles to regain their contractility by a prolonged and continuous period of relaxation.

I have at the present time 2 cases—one four and the other five years old—which had been untreated until they came under my care less than a year ago and which now have regained, as the result of mechanical treatment alone, 80 to 90 per cent. of function which was lost when first seen. This is all the more noteworthy since in the one instance nothing had been done for three years and in the other for four and goes to show that regeneration may take place, but re-establishment of contrac tility may not occur unless relaxation has been afforded the over stretched muscles. In both of these cases there was typical Duchenne Erb palsy involving the fifth and sixth cords. In both the splint applied was similar to the one you have seen. Massage and passive exercises were done twice daily. Improve ment began in one case in four months, and in the other in five. The patients have now worn their appliances nearly a year and have regained the function of nearly all of the paralyzed mus cles with the exception of the external rotators and the radial flexors of the wrist. If improvement does not occur in the ex ternal rotators, an operation will be done to overcome this paralysis by implanting the suprascapular nerve or by reunion of the ends of the suprascapular nerve by means of a nerve-graft.

Both of these cases illustrate the value first of obtaining re laxation of the paralyzed muscles before undertaking any operative procedure, no matter what the interval may have been between the injury and the first observation.

In this case before you we have given the muscles six months of rest without any marked improvement. Further mechanical treatment I do not believe would be productive of any more improvement, and operative interference now offers the best chance. The present examination of this child shows the fol lowing.

The arm hangs limp at the side. There is marked atrophy of the entire extremity. The coracoid process is prominent and the head of the humerus is slightly subluxated dorsally. The

way thus accounting for the greater frequency of fifth and
sixth cervical root types though, as Taylor has pointed out,
any or all of the roots may be torn When the eighth and first
dorsal roots are involved the paralysis is referred to as the
Aran-Duchenne type. Cases are seen at operation in which the
cervical roots are found sometimes completely torn apart.

It is difficult to see how anyone could conceive of this injury
as secondary to capsular lesions about the shoulder joint. The
old view before the work of Duchenne was known was that
these injuries were bony lesions of the humerus. Küstner
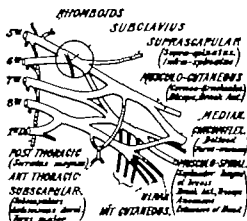
Fig 226.—Schematic drawing of brachial plexus. Circle marks area usu-
ally involved in the Duchenne-Erb type of obstetric paralysis—Erb point.
(Binnie, "Operative Surgery ")

thought birth palsies to be due to separation of the epiphysis of
the humerus Whitman, the result of partial dislocation and,
more recently T Turner Thomas believes birth palsies to be
due primarily to capsular lesions of the shoulder joint, only
secondarily involving the nerve in the vicinity by infiltration of
blood and synovial fluid with subsequent scar formation about
the nerve.

No doubt at birth occasionally dislocation of the shoulder
or separation of the upper epiphysis of the humerus, or other
injuries to the shoulder joint may appear as Küstner Whit

ondary narrowing of the palpebral fissure, contraction of the pupil—myosis—due to paralysis of the dilator fibers supplied by the cervical sympathetic, and to the unopposed action of the third nerve. This group of signs—enophthalmos, narrowing of the palpebral fissure, and myosis—is known as the Klumpke-Déjérine syndrome, and should always be looked for in any brachial plexus injury. Thus, as you see, I am stroking the skin of the neck, and those of you who are close may see that dilatation of the pupil takes place, showing that the sympathetic fibers are intact. This reflex is known as the ciliospinal reflex. Its presence places the lesion above the eighth cervical. Consequently such a lesion as we have here can be accounted for only by injury of the fifth and sixth cervical roots above the clavicle.

The relation of the cervical roots to birth palsy was first pointed out by Duchenne, of Boulogne, in 1872 and two years later by Erb in Germany who cited similar cases in an adult as well as one in an infant. To Duchenne belongs the credit of having first localized the injury in the fifth and sixth roots, and that this deformity was due to a nerve lesion. Erb afterward located the lesion at the junction of the fifth and sixth cervical roots and at the point at which the suprascapular nerve is given off. This location (2 cm. above the clavicle) has since been called Erb's point (Fig. 226).

Neither Duchenne nor Erb attempted to explain the mechanism of the injury. Erb's explanation as due to traction of the fingers *in the axilla during childbirth* seems strangely at variance with his anatomic explanation. In this country the exact mechanism was not clearly shown until Taylor, Clark, and Prout (1905) in experimental and clinical work, showed that birth palsies of the Duchenne type were the result of any violence which forced apart the head and shoulder of the same side, thus stretching the cervical roots of the brachial plexus and in severe cases causing rupture of them. Taylor pointed out that rupture occurred first in the nerve root on which the greatest stretch was placed. These re in the order named, fifth cervical, sixth cervical, seventh cervical, eighth cervical. The fifth, being the longest, is the most oblique and, therefore is the first to give

distribution of the motor paralyses which led to the diagnosis.
Birth palsies of the type I have described here are due *primarily*
to rupture, partial or complete of any or all of the cervical roots
which enter into the formation of the brachial plexus (Figs.
227 228) Injury to the shoulder joint may exist as a concom-
itant lesion, but injuries to the cervical roots in these cases are
not secondary to injury of the shoulder joint.
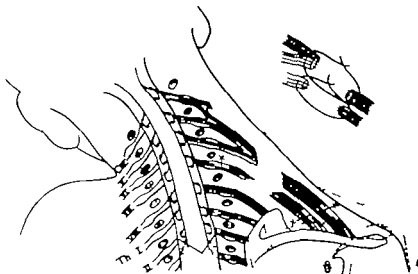
Fig 228.—Same as Fig 227 Schematic drawing to illustrate mechanism
of rupture of the brachial plexus as seen in obstetric paralysis. The head
is bent laterally beyond 30 degrees and the right shoulder lowered, thus in-
creasing the acromiomastoid distance. The fifth and sixth roots are torn
across t their junction the seventh root is also torn. Note the irregular line
of ruptures of these roots, and also that the funiculi are torn t within the
nerve trunk, both distally and centrally Insert show sutures in place and
nerve ends prepared for suture.

In this connection, it is interesting to note that similar
palsies occur in adults as the result of trauma which forces the
head and the shoulder violently apart, that is, increasing the
acromiomastoid distance. I have at present 2 such cases one,
a young man of about twenty who fell off a scaffolding only 10
feet high and landed on the right side of the head and the right

man, and T Turner Thomas hold. However the Aran-Du-
chenne-Duchenne Erb or the Duchenne Erb paralysis alone,
such as we have here today obviously involving muscles sup-
plied through the fifth and sixth nerve roots, can only occur as
the result of an injury primarily to these roots above the clavicle.

Such an injury cannot result from any secondary injury to
the shoulder joint. *It would seem hard to account for a complete*
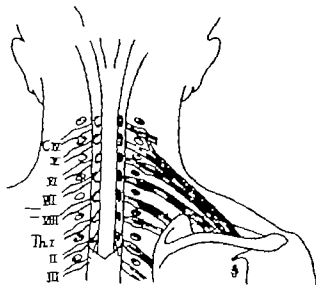
Fig 227 —Schematic dra ing of the brachial plexus as seen from behind,
show ng origin of the roots of the brachial plexus from the spinal cord. The
vertebral arches have been cut way and the dura mater opened. The lines
within the nerve trunks represent the funiculi

*anatomic interruption of one or all of the cervical roots as the result
of the escape of synovial fluid from the shoulder-joint, and scar
formation*   To tear these roots considerable force is needed
Complete interruption of the cervical roots, one or more is
frequently found at operation upon these birth palsies. In no
instance in which we have made the diagnosis of birth palsies
and have operated have I failed to find anatomic evidence of
injury to the nerve roots above the clavicle as indicated by the

You may ask how long one may wait expecting regeneration. I would answer that if the case has been properly treated mechanically delay of a year is not harmful. Unless sufficient time is awaited for regeneration to take place it seems unreasonable to delay three or four months and then to interfere. Such a time is rarely sufficient to admit of downgrowth of neuraxes. On the other hand due to the nature of the trauma to the nerve ends in birth palsy I do not believe each case should be operated as soon as the diagnosis is made, since the lesser injuries at first cannot be distinguished from the more severe and the *lesser* may get well without operation. If then, delay is to be agreed to it seems to me perhaps permissible to wait sufficiently long to allow of regeneration and not arbitrarily decide to wait three or four months. However no set rule can be established, and each case must be judged by itself. To delay longer than twelve months, providing the case has been properly treated mechanically seems to me unwarranted. In such cases, in which regeneration has not taken place, surgical interference is indicated. On the other hand cases have been reported which, however I have not been able to verify of nerve suture being done successfully ten years after injury so that according to this view one need not despair of nerve regeneration even in the presence of a late operation. However generally in prolonged paralysis the muscles have undergone retrogressive changes and there is little left for the nerve to innervate, even if down growth does occur.

When the nerves have been pulled apart, as they are in such a case as this—that is by forcible separation of the head and shoulder—the injury to the nerve trunk is not sharply defined since the funiculi may be pulled apart not only where the gross interruption of the nerve trunk occurs but also within the nerve trunk at various levels both within the central and the distal segments (Fig 229) the funiculi may even be evulsed from the cord itself. For these reasons nerve suture offers the least favorable opportunity for regeneration when contrasted with incised wounds. In the latter the funiculi in the central stump all have their central connections and those in the distal

shoulder thus inclining the head and neck forcibly to the left and the shoulder in the opposite direction. A paralysis resulted similar to a typical birth palsy the same muscles being involved and the same characteristic deformity appearing, with the arm rotated inward and the hand facing backward. In the second case an Italian aged thirty was struck on the shoulder while at work as a construction foreman by a heavy stone which fell from one of the chains as it was being lifted off the wagon. The stone struck a glancing blow on the shoulder and immediate paralysis resulted, involving not only the fifth and sixth but also the seventh cervical roots. In neither of these cases was there any clinical evidence of fracture or dislocation at the shoulder joint. In both of them forcible increase of the acromio-mastoid distance resulted in paralysis similar to those seen as the result of obstetric paralysis. Thus a similar mechanism produced similar pathologic changes in both the infant and the adult.

You may ask me what should be the treatment of these cases from the moment they are first recognized.

As soon after birth as the paralysis is appreciated the arm should be placed in a sling or the sleeve pinned up to a cap, so as to prevent the arm from dragging down the shoulder and separating the nerve ends. A small pad should be worn in the axilla to raise the shoulder and thus tend to approximate the torn nerves. This position should be held until the child is two or three weeks old at which time a splint similar to the one you have seen may be made, except that in the early stages of the injury the arm is carried more vertically thus raising the shoulder and lessening the acromiomastoid distance. Such a splint can be made out of plaster or light metal, removable, so as to permit bathing and massage of the extremity. Both massage and passive movements should be done daily and galvanism may be applied. If the case is thus treated, one may wait year before interfering surgically. By this time the child is stronger and larger and there is more room to work and less shock from the operation, though the scar between the nerve ends may become more dense.

The nerve-fibers within a nerve trunk are divided into those having a medullary sheath and those without such a sheath. The former are called medullated fibers and those without the medullary sheath non medullated. Surrounding the non-medullated nerve-fibers and the medullary sheath of the medullated fibers is a thin outer layer having an oval nucleus on its inner surface. This layer is called the *neurolemma*.

Both medullated and non-medullated fibers are grouped together within the peripheral nerve in bundles, termed *funiculi*, having a connective-tissue sheath which is called *perineurium*. The individual fibers of such a funiculus are separated from each other by a connective tissue called *endoneurium*, and the funiculi are bound together forming the peripheral nerve, by an outer dense connective-tissue sheath, called the *epineurium* Thus the *epineurium* is the outer sheath of the nerve trunk the *perineurium* the sheath which surrounds each funiculus the *endoneurium* the sheath separating each nerve-fiber while the *neurolemma* is the thin fine nucleated sheath surrounding both the non medullated fibers and the medullary sheath of medullated fibers.

I have gone only briefly into detail so as to give the correct terminology in speaking of nerve suture and nerve repair Frequently one sees the term neurolemma suture used, whereas epineural suture is meant. Neurolemma suture obviously is not possible, since it would mean a suture of the sheath of each individual nerve fiber

I might briefly remind you that formerly two views of nerve regeneration were held one that the nerve-fibers regenerated in the peripheral nerve segment of the severed nerve, without necessarily down growth from the central stump taking place the other that regeneration occurred *only* as an outgrowth from the neuraxes of the central stump the distal stump serving principally as a series of conducting tubules for the outgrowth of the neuraxes from the central stump This latter view has been proved by numerous investigators notably Huber Ransom, and others and is the only one now accepted Thus, if a nerve is severed the neuraxes in the distal stump undergo fragments

are intact. However when the nerve roots have been torn apart and have not reunited when placed—as the result of proper splinting—in a mechanically favorable position, operation offers the best possible chance of any success and consequently is worth attempting: yet the limitations due to the nature of the *injury should* be definitely appreciated.
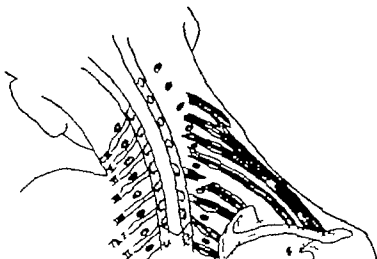

Fig. 229 —Same as Fig 227   Schematic drawing, showing more severe type of injury to brachial plexus   The roots of the brachial plexus are shown avulsed from the spinal cord   The fourth, fifth, sixth, and seventh cervical roots are completely avulsed   the eighth cervical is torn across within the intervertebral foramen   and the first thoracic shows rupture of the funicoli from the spinal cord,   kile the outer continuity of the nerve trunk is still maintained

Before proceeding with the operation it might be well to remind you briefly of the anatomy of a peripheral nerve and a few points concerning nerve regeneration.

The unit of a peripheral nerve is the nerve-fiber or neuraxis. These are the axons of anterior horn cells (motor fibers) or the peripheral processes of the cells of dorsal ganglia (sensory fibers) as well as fibers from the sympathetic ganglia which enter the nerve through gray rami communicans

excising into it so as to obtain a cross-section in which the funiculi may be seen, and in which scar tissue is absent.

I am now freeing the central and am excising into the central stump of both the fifth and sixth roots. We have now a good cross-section in both, though the fifth is torn near the inter vertebral foramen. The funiculi are plainly visible in both They appear as small tubules and stand out distinctly Good cross-areas must be obtained both above and below in order to facilitate downgrowth of the neuraxes.

The shoulder is being raised so as to allow approximation of the nerve ends. I am placing one through-and-through catgut suture and the others are epineural sutures of fine silk. End-to-end apposition is now obtained, but is not so perfect as we should like. In an infant we cannot spend so much time as in an adult, nor when the shoulder is raised can we work readily in the wound, since most of the space is obliterated by the position of the arm.

The wound is now closed in the usual manner and dressing and splint applied. The splint is always made before the operation and properly fitted, so that it can be applied at once. The splint is designed to hold the arm almost vertically and thus in sure elevation of the shoulder thereby diminishing the distance between the acromion and mastoid, and thus helping to approximate the nerve ends. The arm is kept in this position for three weeks, and is then gradually lowered to a right angle.

We shall not expect much improvement in less than a year since it should be remembered that the neuraxes must grow out from the central stump and make the motor and sensory connections distally It is always well to explain this to the parents beforehand and to insist upon continuing mechanical treatment as well as massage and electricity

tion and absorption, while those in the central stump divide and begin to grow out toward the peripheral stump. A single neuraxis may form ten to fifteen branches, each of which may grow out and attempt to find the peripheral stump the latter serving as conducting tubules for the down-growing neuraxes.

It has been asserted that downgrowth of neuraxes takes place at the rate of 1 to 2 mm. per day Thus, the more central the injury the greater the distance the neuraxes must grow However the more distal the injury the less the power of regeneration there seems to be, though this has not been definitely proved so that an injury to the distal part of a nerve may require as long or longer for regeneration than if the nerve were injured more centrally

Operation.—We will now proceed with the operation. The infant is wrapped in warm blankets and surrounded by heaters so as to prevent shock. The operation must be done in as short a time and with as little loss of blood as possible. If all bleeders are promptly grasped and bleeding reduced to a minimum the probability of operative shock will be lessened.

The exposure is the same as in the previous case. I am now down upon the deep cervical fascia. It is thickened over the fifth and sixth cervical roots. Perhaps the cervical fascia was torn at the same time the nerve roots were injured. I am free ing the nerve roots *from the surrounding scar* done greatly perhaps, to the escape of blood *from the nerve ends* when they were torn, *not* blood or synovial fluid from the shoulder joint. Here is the fifth root completely torn across. Note its enlarged end, *due to the persistent effort of the neuraxes at regeneration* Here is the sixth root, also torn across—no here is a small band connecting it with the distal part. I am following this to the distal segment. This band is only scar tissue. I am putting gentle traction on the distal segment so as to mobilize the distal end When traction is being applied it should only be applied to the *distal segment,* and only slight traction is permissible. This should always be done at the distal end only thus avoiding injury to the *central stump* since the latter is the source of regenerating neuraxes. The distal stump is now freed, and I am